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Quality and ethical practice assured:

As reassurance that we are committed to Quality, Environmental and Health and Safety best practice, we are certified to ISO9001:2008 (Quality Management Systems), ISO14001:2004 (Environmental Management Systems) and BS OHSAS18001:2007 (Occupational Health and Safety Management Systems).



We are members of the British Educational Suppliers Association, bound by our membership to follow the code of practice for safety, quality and suitability.



As a member of the British Quality Foundation we demonstrate our strong commitment to process improvement, to bring you the best in both quality product and service.



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We use professional worldwide couriers to deliver your order to over 120 countries worldwide with full online visibility of both stock and orders.



Bespoke support

Should you require additional support from us in any way, we are here to help. From new start ups, to bespoke furniture solutions.



We're where you are

Your international sales manager is based locally to you and is backed by a UK contact centre and head office.



Curriculum Links

To help you deliver your lessons, throughout our catalogue we have included helpful tips detailing how the resources link to the curriculum, whether it be the UK or International Baccalaureate curriculum.

Our **affiliates** around the world...



We are pleased to partner with ECIS, the global best practice network for international schools. This has allowed us to strengthen our collaborative relationship to share and exchange new ideas and initiatives within the international schools community to the benefit of the ECIS member schools and projects.



BSME is an organisation that supports British Curriculum schools in the middle east and holds annual events for BSME member schools and teachers. As an associate member of BSME we will be attending each event where we will be on hand offering expert advice and support on all your educational needs.



AISA membership schools are strongly influenced by their location in Africa. Some AISA schools have an American based curriculum, others are British, and still others have an eclectic mix. All have an international focus. The mission of the Association is to facilitate school effectiveness and to inspire student learning in the international schools of Africa.



The East Asia Regional Council of Schools is an organisation of 130 member schools in East Asia. EARCOS inspires adult and student learning through its leadership and service and fosters intercultural understanding, global citizenship and exceptional educational practices within our learning community. EARCOS play a prominent leadership role throughout the global educational community.

Meet our Experts



Angie Ridout

Angie was awarded Science Technician of the year 2013 and currently runs a STEM club at Dagenham park Church of England school, Essex.



Andy Bakin

Andy is an expert within the engineering and computer Science field. He is a Professional Electronics Engineer and Product Development Manager who has designed products for both the Educational and Hobbyist market. Check out Laika, page 497.



Brona Doyle

Brona Doyle has worked in various aspects of Environmental Education and Outdoor Learning for the past seventeen years covering early years to A level, further education and teacher training, her specialist subjects are all aspects of Environmental Science, Biology and Geography. Brona currently oversees all aspects of Formal Learning at Royal Botanic Gardens, Kew.



Elaine Stephen MBE

Deputy Head Teacher Elaine Stephen MBE has spent over 30 years in primary education, and is also a multi-award winning product developer having successfully brought a series of educational products to market.



David Crellin

He is a multiple award winner who has been developing hardware and software for Science Education since 1982 specialising in data logging.

The BBC micro:bit

From robots to musical instruments – the possibilities are endless



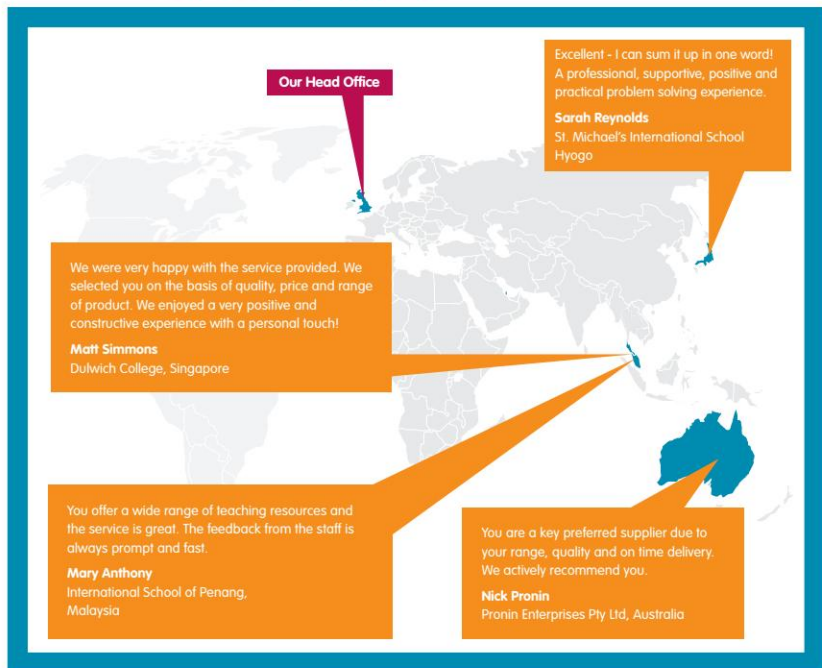
Philip Harris is really excited to be working with the BBC to deliver their brand new **micro:bit**.

The micro:bit is a handheld, fully programmable computer being given free to every Year 7 or equivalent child across the UK.

This device has a lot of features such as 25 red LED lights that display messages and programmable buttons that can be used to control games or pause and skip songs on a playlist.

For more information about the BBC **micro:bit** see page 494.

What our customers think



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Monkey and Hunter Launcher

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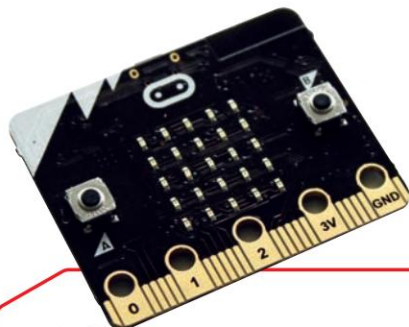




The touchscreen display adds even more functionality to your Raspberry Pi™, making it truly interactive as a tablet, infotainment system or standalone device.

E8R06325

page 496

each **£59.95**

Inspire students to get creative with digital technology and develop their STEM skills with the BBC micro:bit.

page 494

each **£13.95**

page 494

pack 10 **£133.95**



Everything you need to get stuck into STEM projects using the Arduino prototyping platform.

E8R06218

page 495

kit £53.95



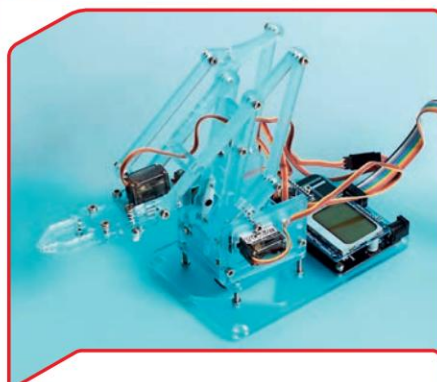
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The world's first and best 3D printing pen. Ideal for students exploring design, architecture and engineering.

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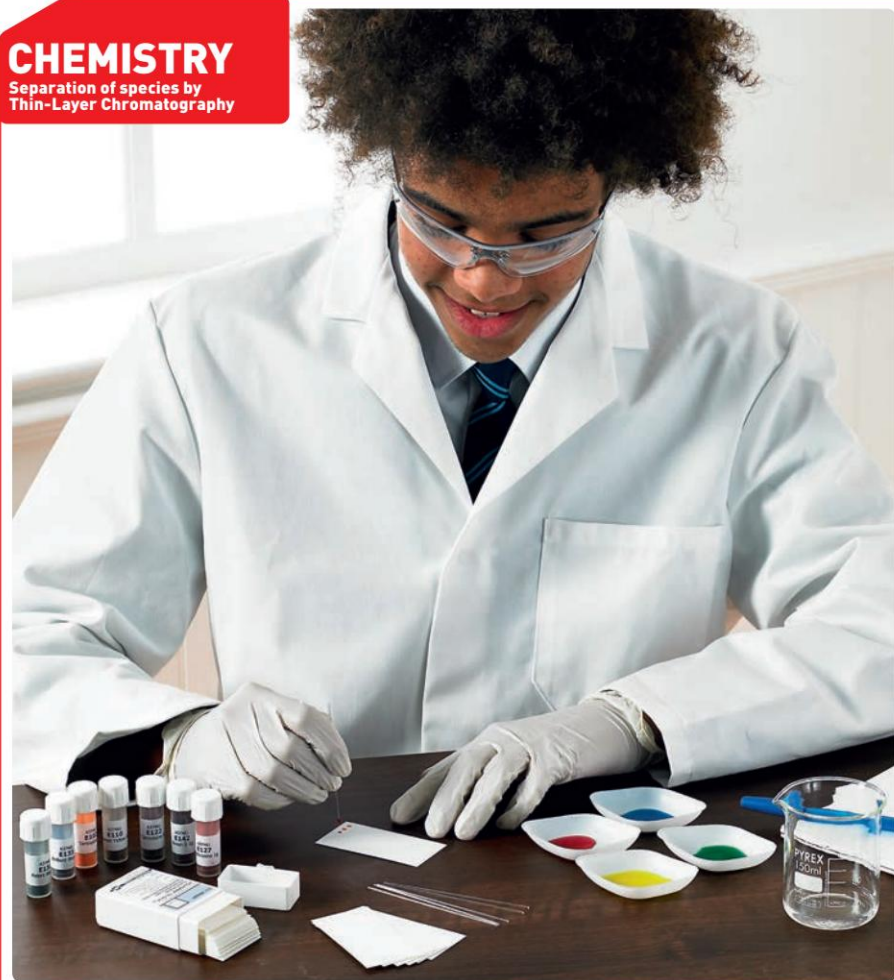
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A-LEVEL PRACTICAL ENDORSEMENT:

We supply all relevant equipment to help your students complete the compulsory A-level Practicals.

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Micrometer

E8R06348 page 408 each **£15.95**

Automatic Wire Stripper

E8A88109 page 466 each **£8.39**

Nickel Chrome Wire 26 SWG

E8R05726 page 460 125g reel **£21.95**

MICROSCOPES

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CHOOSE THE RIGHT MICROSCOPE FOR YOU!

Our comprehensive range of microscopes enables you to easily choose the instrument relevant to your needs. We offer microscopes, stereo microscopes, digital cameras plus an innovative tablet PC with a 3Mpx digital camera and software to capture, record and edit images.

The sturdy microscopes are student friendly and offer excellent quality, safety features as well as robust construction.

BESPOKE DESIGN SERVICE

We are confident that you will find the right microscope for you, however should you require a unique bespoke microscope, we can help. Our custom design service allows you to create a bespoke instrument to your exacting standards – perfect for Further Education.

PHILIP HARRIS MICROSCOPES

Based on our previous best-selling range, these models are popular around the world. The excellent quality, coupled with solid reliability, result in microscopes which can be trusted in schools and colleges for many years.



OPTIKA MICROSCOPES

Our microscope manufacturer, Optika Microscopes, are a leading manufacturer in Europe. Their microscopes offer excellent quality with a unique LED illumination system which includes a powerful lamp, minimising electrical consumption.

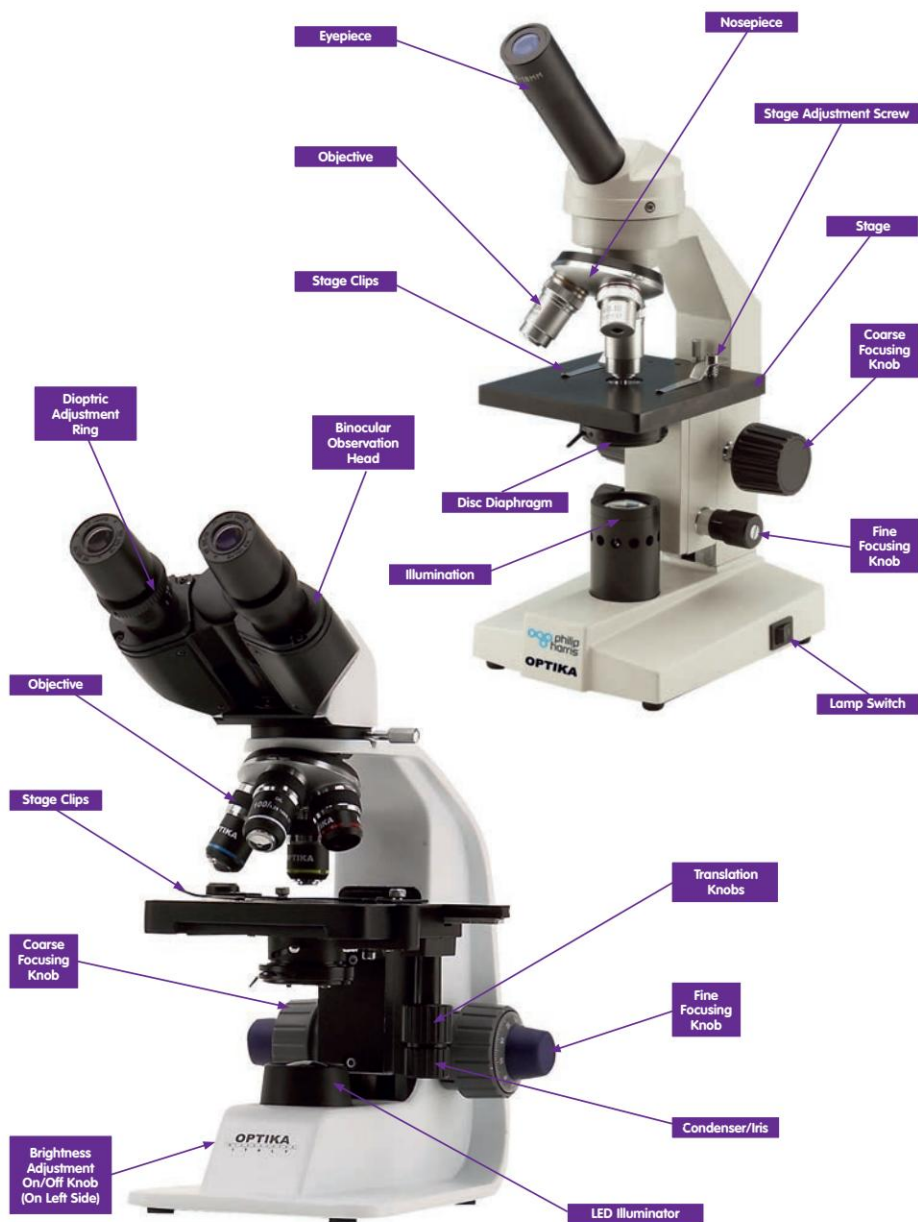


DINO-LITE HAND-HELD MICROSCOPES

Dino-Lite digital microscopes provide a powerful, portable and feature rich solution to microscopic inspection. Dino-Lite microscopes offer versatility and flexibility within any school or college.



All of our microscopes are supplied with UK and Euro Plug leads, for international use. Email techsupport@philipharris.co.uk for more advice!





LED Illumination

A modern type found on an increasing number of microscopes. Ideally suited to education as it provides a very even illumination with excellent contrast. Cooler than Halogen, it is ideal for live specimens. Most LED units are rechargeable so there is no need for mains power during use.

Magnification

The factor by which the image is larger than the object. The total magnification is calculated by multiplying the magnification of the objective by that of the eyepiece. See also resolution.

Plano-concave Mirror

Usually two-sided (50mm diameter), with one side flat (plano) and the other curved (concave). Always use the plane surface with a microscope lamp. Use the concave surface for very low NA objectives and with natural light.

Objective Lens

These form the primary image of the object which is further magnified by the eyepiece. The objective lens body will be marked as shown above.

Parcentred

The optical system (condenser, eyepiece and objective lens), are directly aligned to minimise aberration.

Parfocality (parfocal)

The property of a microscope which ensures they stay in focus when objectives are changed.

Polariser

An addition to a microscope which reduces light to a single plane revealing spectrum colours. Ideal for use with rock sections or other crystalline specimens.

Resolution

The resolving power of a microscope indicates the minimum distance between two points that can be distinguished. High magnification does not mean high resolution. See also numerical aperture.

Retractable Objective

Spring-loaded objective that prevents damage to microscope slides should the objective be lowered too far.

Slip Clutch

A safety mechanism to prevent gear stripping if the coarse focus is racked down beyond the normal stop position.

Stage

A platform upon which the microscope slide is placed. The slide is usually held in place by stage clips in which case the slide can be moved around manually. For more accurate positioning of slides a mechanical stage can be used.

Stereo Microscope

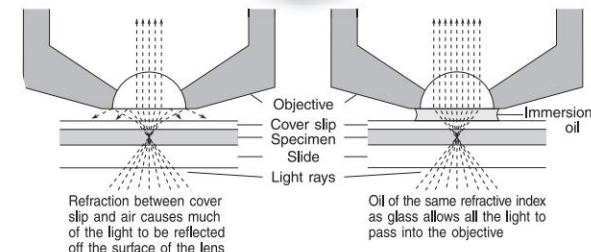
Used to observe specimens and larger objects in 3D, such as fungi, fossils, crystals. Also used in microdissection. The magnification range is lower than a compound microscope, typically x20 to x80.

Numerical Aperture (NA)

The Numerical Aperture of the lens determines its ability to resolve fine detail. The greater the NA value of the optical system (condenser and objective lens), the greater the resolution. (Numerical apertures are marked on both the condenser and the objective.)

Numerical Aperture of Various Optical Elements:

x10 Achromat	0.25
x100 Achromat	1.25
Abbe Condenser	1.25



Achromatic

Achromatic objectives are used in most microscopes. They bring light of different wavelengths to a focus producing a clearer image with less distortion and reducing chromatic aberration.

Body Tube Length

Distance between the objectives and the top of the body tube (usually 160mm). Objectives are designed to fit a specific microscope. Incorrect objectives will result in aberration.

Coaxial Focus

A focusing arrangement where the fine and coarse focus knobs are situated together and share a common axis.

Condenser

The condenser focuses light upon a specimen under investigation. A built-in condenser has a fixed focal length and a numerical aperture of 6.65. The Abbe condenser has a spiral focusing system and a numerical aperture of 1.25. To focus the condenser place a sharp object such as a needle or a pencil onto the light source and adjust the condenser height until the object is in sharp focus. The numerical aperture (NA) of the condenser should be equal to, or greater than, the highest objective NA - usually 1.25 (for a 100x objective).

Compound Microscope

The "Classic Microscope". Used to observe specimens and microscope slides in 2D. Using either transmitted or reflected light, quite high magnifications may be obtained.

Chromatic Aberration

When a lens fails to bring light of differing wavelengths to a common focus colour fringes will be apparent around the edges of the image. This is known as Chromatic Aberration and can be reduced by using Achromatic Objectives.

Disc Diaphragm

A rotating disc situated beneath the stage. The disc contains five or six apertures, of different sizes which are selected to control light levels and thereby contrast of the specimen. See also Iris Diaphragm.

Din

Abbreviation for Deutsche Industrie Normen. An industry standard for optics indicating a high quality lens.

Eyepiece

The primary image is formed by the objective lens - the eyepiece then forms a secondary image. There are two common eyepieces which differ in lens arrangement. The Huyghenian eyepiece has a similar field of view than the Widefield or Ramsden. All Philip Harris microscopes have locked in eyepieces for security.

Eyepiece Diaphragm

The diaphragm defines the round field-of-view seen when looking down the microscope. It accepts gratitudes and is positioned at a point that ensures the graticule scale is in focus with the specimen image.

Field of View

Area that is visible through the eyepiece when the microscope is in focus.

Graticule

A glass or plastic disc with printed on scale. Graticules are mounted in the eyepiece, calibrated using a stage micrometer and allow accurate measurement of subjects under observation.

Immersion Objective

When high magnification and high resolution are required it is necessary to exclude air, which can cause reflection, between the microscope slide and the lower surface of the objective. Exclusion of air is achieved by using a drop of immersion oil which forms a light-tight connection between the two surfaces. A x100 oil immersion is necessary for viewing small specimens such as bacteria and cell organelles and must be used with an Abbe condenser.

Iris Diaphragm

A fully adjustable leaf diaphragm used to control the amount of light converging on the specimen, thereby altering contrast. See also disc diaphragm.

1. What do you want to observe?

2D Images e.g. microscope slides:

Compound Microscope.

- View slide-mounted specimens that are thin enough to allow light to pass through them
- Examine pre-mounted slides and pond-water specimens such as algae and protozoans
- Provide high-power magnification (40x to 1,000x), a narrow field of view and a short working distance

3D Objects e.g. fossils, microdissection:

Stereo Microscope.

- Observe unmounted, macro-sized specimens that are too thick to allow light to pass through them
- View insects, plants, rocks, coins and more
- Provide low-power magnification (10x to 40x), a wide field of view and a long working distance



2. Who will be using it?

Pre-16 Students:

For absolute beginners we recommend the Economy Microscope, however all of our **Philip Harris Microscopes** are designed to meet the needs of secondary school students.

Post-16 Students:

The **Philip Harris Stereo Microscopes** or any of the **Compound Microscope** range.

College/University Students:

Digital Compound Stereo Microscope or the **Optika Monocular Ecosim Microscope**.

Teacher/Demonstrator:

We recommend our **Trinocular Microscope** or any of our microscopes with integrated digital cameras.

Head



Monocular
used for standard viewing.
Binocular
adds comfort for long term viewing.
Trinocular
3 viewing ports.

Focus



Coarse only

has moderate stage movement with each turn.

Separate coarse and fine

large coarse focus knob used with 4X objective for scanning slide, small fine focus knob used for small or slight focus adjustments on higher powers.

Coaxial

makes switching from coarse to fine focus easier.

3. What type of illumination do you need?

Low Magnifications (up to 100x):

Mirror or Built-in Light Source.

Higher Magnifications:

Mirror and Lamp or Built-in Light Source.

There are 2 types of built-in illumination available:

Tungsten:

The most common and least expensive.
Brighter than fluorescent.

LED:

Cool even light. Ideal for live specimens. Long life from 5000 - 10000 hours.

4. How will the microscope be used?

- For short periods of time
- For standard viewing

We recommend **Monocular Head**.

- For extended periods of time
- For comfort delivering long term viewing

We recommend **Binocular Head** (offers greater comfort and less eye strain).

- While user is seated:
We recommend **Inclined Head**.

- While user is standing:
We recommend **Vertical Head**.

With a computer or television:
We recommend **Digital Microscope** (please check specifications to ensure compatibility).

- With third person viewing (teacher or camera):
We recommend **Trinocular Head**.

Condenser



0.65 N.A. fixed field condenser
gives good resolution to 650X total magnification.

1.25 N.A. Abbe condenser
needed for magnifications between 650X and 1250X.

Centerable Abbe condenser
enhances phase contrast microscopy.

Stage



Gliding stage allows you to move stage instead of slide for better control. All have one touch stage clips-lift both clips at once with one push.

Mechanical stage gives precise control of slide. It features sure grip slide holder and coaxial control knobs.

Objectives



4X, 10X, 40X for normal studies.

40X* gives some cell details.

100X needed for study of bacteria.

***40X and 100X** are sealed and retractable.

***ASC** (Achromatic Special Contrast) gives images that rival semi-plan Objectives.

***E-PLAN** Deliver long working distances.

3 Year Warranty

Practical Information

- Ideal for beginners, with easy-to-use controls
- Monocular head
- Up to 400X magnification
- Separate coarse and fine focus
- LED illumination with rechargeable batteries

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harris**
OPTIKA

Philip Harris Monocular Microscope 400X B-20R

Monocular biological microscope with 400X magnification.

360° rotating head, with 45° inclined eyepiece tube.

Wide field 10X/16mm eyepiece.

Triple nosepiece rotating in both directions with objective click locking system.

Achromatic objectives: 4X, 10X and telescopic 40X.

Separate coarse and fine focusing knobs with different axis, with focus tension adjustment.

Movable round stage, 90mm diameter, 5mm moving range, slide clips.

White LED, with brightness control.

Full Specification:

Rechargeable batteries included.

Model: B-20R.

Head: Monocular, 360° rotating, with 45° inclined eyepiece tube.

Eyepiece: WF10X/16mm.

Objectives: Achromatic 4X, 10X, 40X (telescopic).

Stage: Movable, 360° rotating, dia. 90mm, with sample clips.

Focusing: Separate coarse and fine control knobs.

Illuminator: LED with rechargeable battery.

Age Suitability: 11-16 Years

E8R05544

each **£161.95**



Practical Information

- Ideal for beginners and entry level students
- Monocular head
- Up to 400X magnification
- Coaxial coarse and fine focus
- Low voltage LED illumination

3 Year Warranty

Philip Harris Monocular Microscope 400X B-20C

A simple, full functioning instrument that is great for students to graduate on to. Students who have had experience with microscopy before will find very confident when using this instrument and will progress quickly, taking advantage of all the functions of the instrument to maximise their microscopy work. Also with rechargeable batteries so that it can be used in practically any situation.

Full Specification:

Head: monocular, 45° inclined, 360° rotatable.

Eyepieces: WF10X/18mm.

Nosepiece: triple rotating in both directions with objective click stop.

Objectives: Achromatic 4X/NA 0.10; 10X/NA 0.25; 40X/NA 0.65 spring.

Total magnification: 40X, 100X, 400X.

Optical system: Achromatic.

Stage: Size 105 x 95mm with double layer mechanical stage and specimen holder.

Focusing: Coaxial coarse and fine focusing knobs located in both sides of the stand.

Illumination: Low voltage LED light with brightness control.

Accessories included: Electrical cable, dust cover and instructions.

E8R05545

each **£209.95**



3 Year Warranty

Practical Information

- Robust microscope for beginners with interchangeable eye pieces
- Monocular head
- Up to 400X magnification
- Separate coarse and fine focus
- 230V/20W tungsten bulb illumination



Philip Harris Compound Monocular M-100FL Microscope

Monocular biological microscope with magnification of 400X which can be increased to 1600X with the help of the additional 16X eyepiece and 100X objective.

Head with eyepiece tube inclined at 45° rotating through 360°.

WF10X/18 wide field eyepiece, triple revolving nosepiece rotating in both directions with click locking at the objectives positions.

DIN 4X, 10X and 40X (telescopic) achromatic objectives.

Macro and micrometric focusing knobs located on both sides of the stand. The micrometric focusing controls are graduated.

Specimen table complete with slide clamps, 120 x 110mm.

N.A. 0.65 condenser, iris diaphragm and filter holder. Built-in illuminator with 230V/20W tungsten bulb and condensing lens above.

Full Specification:

Model: M-100FL

Head: Monocular, 360° rotating, with 45° inclined eyepiece tube.

Eyepiece: WF10X/18mm.

Objectives: Achromatic DIN 4X, 10X, 40X (telescopic).

Stage: With sample clips, 120 x 110mm.

Focusing: Separate coarse and fine control knobs.

Condenser: N.A. 0.65, iris diaphragm and filter holder.

Illuminator: 20W tungsten.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-18 Years

E8R05546

each **£131.95**

Practical Information

- Robust microscope with interchangeable eye pieces
- Monocular head
- Upto 400X magnification
- Separate coarse and fine focus
- LED illumination with rechargeable batteries



3 Year Warranty



Philip Harris Monocular Microscope LED Illuminator M100FLED

Monocular microscope with the same technical specifications as model M-100FL, with the addition of built-in, 3-LED illuminator with 3 rechargeable batteries. The illuminator can be used for 24 hours continuously without any recharge.

Battery charging enabled while using the microscope.

External recharger included.

Battery pack: 3 x AA, 1.2V NiMH, 1000 mAh, replaceable by the user.

Time required for a full recharge: 10 hours.

Battery runtime with LED at maximum power: 12 hours.

Battery charging enabled while using the microscope. Performances estimated with batteries at their maximum efficiency.

Full Specification:

Model: M-100FLED.

Head: Monocular, 360° rotating, with 45° inclined eyepiece tube.

Eyepiece: WF10X/18mm.

Objectives: Achromatic DIN 4X, 10X, 40X (telescopic).

Stage: With sample clips, 120 x 110mm.

Focusing: Separate coarse and fine control knobs.

Condenser: N.A. 0.65, iris diaphragm and filter holder.

Illuminator: LED with rechargeable batteries.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-18 Years

E8R05547

each **£149.95**

**Practical
Information**

- Excellent entry level stereo microscope
- Binocular head
- Up to 40X magnification
- Rack and pinion focus
- Tungsten bulb illumination

3 Year Warranty



Philip Harris Binocular Stereo ST-30-2LF Microscope

Stereo microscopy is easy with this simple instrument that will allow the student to be completely in control and have fun investigating the microscopic world. This a standard instrument used in classrooms the world over, solid construction and reliable.

Full Specification:

Head: Binocular 45° inclined at the front side. Interpupillar distance 51-75mm.

Eyeieces: WF10X/20mm with eyecups of protection.

Nosepiece: Turret type.

Objectives: Achromatic 2X and 4X.

Total magnification: 20X, 40X.

Optical system: Achromatic.

Stand: Pillar stand.

Stages: Black/white and frosted glass.

Focusing: By rack and pinion controlled by a pair of knobs.

Illumination: Incident and transmitted illumination by tungsten bulb 12V/10W.

Accessories: Electrical cable, dust cover, manual instructions.

E8R05548

each **£161.95**



Practical
Information

- Ideal for longer periods of use
- Binocular head
- Up to 40X magnification
- Rack and pinion focus
- LED illuminator and rechargeable batteries

3 Year Warranty

Philip Harris Binocular Stereo Microscope LED Illuminator ST302LEDF

Like the traditional stereo microscope ST30-2LEDF, this is an LED illumination version of this instrument, to suit the heavy user, who will benefit from clear light, cool temperatures that won't affect their specimens and the long life LED. The student will enjoy being completely in control and have fun investigating the microscopic world. This is a reliable instrument used in classrooms the world over with a solid construction.

Full Specification:

Head: Binocular 45° inclined at the front side; interpupillary distance 51-75mm.

Eyepieces: WF10X/20mm with eyecups of protection.

Nosepiece: Turret type.

Objectives: Achromatic 2X and 4X.

Total magnification: 20X, 40X.

Optical system: Achromatic.

Stand: Pillar stand.

Stages: Black/white and frosted glass.

Focusing: By rack and pinion controlled by a pair of knobs.

Illumination: Incident and transmitted LED illumination by rechargeable battery.

Accessories: Electrical cable, dust cover, manual instructions.

Age Suitability: 11-16 Years

E8R05549

each **£185.95**



- Excellent intermediate stereo microscopes which rotates through 360°
- Binocular head
- Up to 40X magnification
- Rack and pinion focus
- Tungsten bulb illumination

3 Year Warranty

Philip Harris Binocular Stereo Microscope 360° Rotatable ST402L

Stereo microscopy is easy with this simple instrument that will allow the student to be completely in control and have fun investigating the microscopic world. This a standard instrument used in classrooms the world over, solid construction and reliable.

Full Specification:

Head: Binocular 45° inclined rotating 360°. Interpupillary distance 51-75mm.

Eyepieces: WF10X/20mm with eyecups of protection.

Nosepiece: Turret type.

Objectives: Achromatic 2X and 4X.

Total magnification: 20X, 40X.

Optical system: Achromatic.

Stand: Pillar stand.

Stages: Black/white and frosted glass.

Focusing: By rack and pinion controlled by a pair of knobs.

Illumination: Incident and transmitted illumination by tungsten bulbs 12V/10W.

Accessories: Electrical cable, dust cover, manual instructions.

Age Suitability: 11-16 Years

E8R05550

each **£161.95**



Practical Information

- Great for beginners with easy to use controls
- Binocular head
- Up to 40X magnification
- Rack and pinion focusing
- Double, LED, adjustable illuminator

3 Year Warranty

Philip Harris Lab 10 Stereo Microscope

A stylish and functional reimagining of the traditional stereo microscope. With adjustable controls in blue, an easy grip handle to help with carrying and LED illumination, this is a robust instrument built for heavy and demanding use.

The Lab 10 also features dioptic compensation adjustable on both eyepiece tubes. This is a seriously advanced instrument for the more advanced user.

Full Specification:

Double adjustable illuminator for incident and transmitted light fitted with two high-efficiency LED light sources. The angle of the incident illuminator is adjustable.

Voltage: 110/240Vac, 50/60Hz, 1A; Fuses: T1A 250V;
Maximum power consumption: 7W.

Focusing: By means of a rack and pinion controlled by a pair of knobs placed on both sides of the microscope.

Stage: Fitted with a semi-transparent plastic disc for transmitted light with specimen clamps. Stand Fixed arm type with focusing mechanism.

Head: Binocular heads, 360° rotating, 45° inclined. Adjustable dioptic compensation on both eyepiece tubes. Interpupillary distance adjustable between 51 and 75mm.

Eyepieces: WF10X/20mm widefield eyepieces.
Objectives: 2X and 4X objectives providing total magnification of 20X and 40X.

Working distance: 80mm.

Accessories: Manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

E8R05551

each £245.95



3 Year Warranty

Practical Information

- Ideal for beginners and intermediate users
- Binocular head
- Up to 45X magnification
- Rack and pinion focusing
- Adjustable, double LED illumination



Philip Harris Lab 20 Stereo Zoom Microscope

Double adjustable illuminator for incident and transmitted light fitted with two high-efficiency LED light sources. The angle of the incident illuminator is adjustable.

Voltage: 110/240Vac, 50/60Hz, 1A; Fuses: T1A 250V Maximum power consumption: 7W.

Focusing: By means of a rack and pinion controlled by a pair of knobs placed on both sides of the microscope.

Stage: Fitted with a semi-transparent plastic disc for transmitted light with specimen clamps. Stand Fixed arm type with focusing mechanism.

Head: Binocular heads, 360° rotating, 45° inclined. Adjustable dioptic compensation on both eyepiece tubes. Interpupillary distance adjustable between 51 and 75mm.

Eyepieces: WF10X/20mm widefield eyepieces.

Objectives: 0.7x-4.5X zoom objectives. Zoom factor: 6.43:1. Working distance: 85mm.

Accessories Manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-18 Years

E8R05552

each **£389.95**



Practical Information

- Ideal for transition into secondary
- Monocular head
- Up to 400X magnification
- Coaxial coarse and fine focusing mechanism
- High intensity, cold, white LED, with adjustment knob

Economy Science

3 Year Warranty

Optika Monocular Microscope LED Condenser B50

Educational Microscope for routine applications. Dye-cast frame, with high stability and ergonomics, for transmitted light observation.

Full Specification:

Illumination: Special condenser with built-in illuminator. Light source: high intensity cold white LED, with adjustment knob. Input voltage: 110/230Vac, 50/60Hz. Max required power: 1W. Observation modes: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism.

Stage: 120mm x 110mm stage with sample clips.

Nosepiece: Three positions revolving nosepiece, rotation on ball bearings.

Head: Monocular, 45° inclined and 360° rotatable.

Eyeiece: WF10X/18 widefield eyepiece with field number 18.

Objectives: Achromatic objectives with mechanical tube length 160mm, 0,17mm cover glass:

- Achromatic 4X
- Achromatic 10X
- Achromatic 40X

All objectives are treated with an anti-fungus treatment.

Condenser: N.A. 0,65 pre-centered, with built-in illuminator.

Dimensions: H350 x W132 x D220mm.

Accessories: Instruction manual and dust cover included.

Age Suitability: 11-16 Years

E8R05553

each **£137.95**



3 Year Warranty

Practical Information

- Ideal for more demanding use
- Monocular head
- Up to 400X magnification
- Coaxial coarse and fine focusing
- White LED illumination with intensity control

Optika Monocular Ecovision Microscope B-151

This is the traditional compound microscope with a modern finish. It is an LED microscope intended for the more demanding user.

Full Specification:

Illumination: White LED light source with light intensity control using a knob on left side of the frame.

LED power: 1W. Colour temperature: 6300K. LED average lifetime approximately: 50,000h.

External power supply 100/240Vac, 50/60Hz, output: 5Vdc 500mA.

Observation Mode: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Plain stage 125 x 120mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings. Head Monocular observation head, inclined 30° and rotatable 360°.

Eyeieces: Widefield eyeieces WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm, made by following objectives:

- 4X, A.N. 0.10, W.D. 18mm
- 10X, A.N. 0.25, W.D. 7mm
- 40X, A.N. 0.65, W.D. 0.53mm

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser N.A. 0.65 pre-centred.

Dimensions: H350 x W170 x D210mm.

Weight: 4kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

EBR05554

each **£197.95**



Practical Information

- Ideal for advanced students and post 16
- Binocular head
- Up to 600X magnification
- Coaxial coarse and fine focusing mechanism
- White LED illumination with adjustable intensity

Ideal For
Further
Education

3 Year Warranty

Optika Binocular Microscope B-157 600X

An advanced instrument, capable of up to 600X magnification, featuring a binocular head intended for easy viewing for long term, heavy users where comfort is a consideration.

Full Specification:

Illumination: Light source type: white LED; light intensity control using a knob on left side of the frame. LED power: 1W. Colour temperature: 6300K. LED average lifetime approximately: 50,000h

External power supply 100/240VAC, 50/60Hz, output: 5Vdc 500mA.

Observation Mode: Brightfield

Focusing: Coaxial coarse and fine focusing mechanism

(graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 125 x 116mm, X-Y movement range 76 x 30. Specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1 mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings. Head binocular observation head, inclined 30° and rotatable 360°. Diopter adjustment on left eyepiece. Interpupillary adjustment 48-75mm. Eyepieces Widefield eyepieces WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

- 4X, A.N. 0.10, W.D. 18mm
 - 10X, A.N. 0.25, W.D. 7mm
 - 40X, A.N. 0.65, W.D. 0.53mm
 - 60X, A.N. 0.85, W.D. 0.45mm
- All objectives are treated with an anti-fungus treatment.
Condenser: Abbe condenser, N.A. 1.2 precentered.

Dimensions: H350 x W170 x D210mm.

Weight: 4kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 16-18 Years

EBR05555

each **£347.95**



3 Year Warranty

Bespoke Service Available



Practical Information

- Ideal for longer periods of use
- Binocular head
- Up to 1000X magnification
- Coaxial coarse and fine focusing
- LED illumination with intensity control

Optika Binocular Microscope 1000X B-159

An advanced instrument, capable of up to 1000X magnification, featuring a binocular head intended for easy viewing for long term, heavy users where comfort is a consideration.

Full Specification:

Illumination: White LED light source. Light intensity control using a knob on left side of the frame. LED power: 1W. Colour temperature: 6300K. LED average lifetime approx. 50,000h.

External power supply: 100/240Vac, 50/60Hz, output: 5Vdc 500mA.

Observation Mode: Brightfield

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 125 x 116mm, X-Y movement range 76 x 30. Specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Binocular observation head, inclined 30° and rotatable 360°. Diopter adjustment on left eyepiece. Interpupillary adjustment 48-75mm.

Eyepieces: Widefield eyepieces WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

• 4X, A.N. 0.10, W.D. 18mm

• 10X, A.N. 0.25, W.D. 7mm

• 40X, A.N. 0.65, W.D. 0.53mm

• 100X, A.N. 1.25, W.D. 0.13mm (oil immersion)

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.2 pre-centred.

Dimensions: H350 x W170 x D210mm.

Weight: 4kg

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 16-18 Years

E8R05564

each **£321.95**



Practical Information

- Excellent optics giving great magnification
- Monocular head
- Up to 1000X magnification
- Coaxial coarse and fine focusing
- LED illumination with intensity control

3 Year Warranty

Bespoke Service Available

Optika Compound Microscope Monocular B-191

An advanced instrument, capable of up to 1000X magnification, monocular head with a modern finish and robust build. Perfect for use in examination assessed work and advanced level education.

Full Specification:

Illumination: White LED light source; light intensity control using a knob on left side of the frame. LED power 3W. Colour temperature: 6300K LED average life time approx. 50,000h. Voltage: External power supply 100/240V, 50/60Hz, output: 7.5 V. Max power required: 7W.

Observation Mode: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, 125 x 115mm, X-Y movement range 76 x 30, specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1mm.

Revolver: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Monocular observation head, inclined 30° and rotatable 360°.

Eyepieces: Wide field WF10X/18 eyepieces with field number 18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

- 4X, A.N. 0.10, W.D. 18mm
- 10X, A.N. 0.25, W.D. 7mm
- 40X, A.N. 0.65, W.D. 0.53mm
- 100X, A.N. 1.25, W.D. 0.13mm (oil immersion)

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.25 pre-centred

Dimensions: H370 x W235 x D290mm.

Weight: 6.5kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

E8R05556

each **£317.95**

Practical Information

- Excellent optics giving great magnification
- Binocular head
- Up to 1000X magnification
- Coaxial coarse and fine focusing
- LED illumination with intensity control

3 Year Warranty



Optika Binocular Microscope B192

An advanced instrument, capable of up to 1000X magnification, binocular head with a modern finish and robust build. Perfect for use in examination assessed work and advanced level education.

Full Specification:

Illumination: Light source type X-LED with white LED; light intensity control using a knob on left side of the frame. LED power 3W. Colour temperature: 6300K. LED average life time approx. 50,000h. Voltage: external power supply 100/240V, 50/60Hz, output: 7.5 V. Max power required: 7W

Observation Mode: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, 125 x 115mm, X-Y movement range 76 x 30, specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1mm.

Revolver: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Binocular observation head, inclined 30° and rotatable 360°. Diopter adjustment on left eyepieces. Interpupillary adjustment 48-75mm.

Eyepieces: Wide field WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

• 4X, A.N. 0.10, W.D. 18mm

• 10X, A.N. 0.25, W.D. 7mm

• 40X, A.N. 0.65, W.D. 0.53mm

• 100X, A.N. 1.25, W.D. 0.13mm (oil immersion)

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.25 pre-centred.

Dimensions: H370 x W235 x D290mm.

Weight: 6.5kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

EBR05557

each **£425.95**

Practical Information

- Teacher or computer three way viewing
- Trinocular head
- Up to 1000X magnification
- Coaxial coarse and fine focusing
- LED illumination with intensity control

3 Year Warranty

**Optika Trinocular Microscope B193**

An advanced instrument, capable of up to 1000X magnification, with a modern finish and robust build. Perfect for use in examination assessed work and advanced level education. The trinocular head means students can use the binocular eyepieces for their investigations and teachers can examine and support them via the vertical monocular eyepiece without having to change the settings of the instrument, allowing uninterrupted workflow and better learning outcomes.

Full specification:

Illumination: Light source type X-LED with white LED; light intensity control using a knob on left side of the frame. LED power 3W. Colour temperature: 6300K. LED average life time approx. 50,000h. Voltage: external power supply 100/240V, 50/60Hz, output: 7.5 V. Max power required: 7W

Observation Mode: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 125 x 115mm, X-Y movement range 76 x 30, specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1mm.

Revolver: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Trinocular observation head, inclined 30° and rotatable 360°. Photo port light split: 50/50 fixed. Diopter adjustment on left eyepiece. Interpupillary adjustment 48-75mm. Eyepieces: Wide field WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

• 4X, A.N. 0.10, W.D. 18mm

• 10X, A.N. 0.25, W.D. 7mm

• 40X, A.N. 0.65, W.D. 0.53mm

• 100X, A.N. 1.25, W.D. 0.13mm (oil immersion)

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.25 pre-centred

Dimension: H370 x W235 x D290mm.

Weight: 6.5kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

E8R05558

each **£521.95**



3 Year Warranty



Practical Information

- Integrated digital camera
- Monocular head
- Up to 400X magnification
- Coaxial coarse and fine focusing
- White LED illumination with intensity control

Optika Digital Monocular Microscope B-150DMR

A fully functioning compound microscope with additional digital imaging capabilities. A brilliant robust instrument that is suitable for experienced users who want to document their investigations. Use the digital camera for taking great shots that will supplement any report that will capture the essence of the work.

Microscope Specification:

Illumination: White LED; light intensity control using a knob on left side of the frame.

LED power: 1W. Colour temperature: 6300K LED average lifetime approximately: 50,000h. External power supply 100/240V, 50/60Hz, output: 6Vdc, 2.5A. Internal NiMH rechargeable battery (up to 15 hours of use from a single charge, LED at medium intensity).

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 125 x 116mm, X-Y movement range 76 x 30. Specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Monocular digital observation head, inclined 45° and rotatable 360°.

Eyepieces: Widefield eyepieces WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

- 4X, A.N. 0.10, W.D. 18mm
- 10X, A.N. 0.25, W.D. 7mm
- 40X, A.N. 0.65, W.D. 0.53mm

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.2 pre-centred.

Dimensions: H350 x W170 x D210mm.

Weight: 4kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Digital Camera Specification:

Image format: 1280 x 1024 pixel.

Pixel size: 2.8µm x 2.8µm.

Sensor: 1/3.2" CMOS

Output: USB 2.0 port.

SNR: 42.3dB. Dynamic Pro Range 71dB

Exposure Time: 20s - 1/1000s

Effective Digits: 10bit - on chip

Sensitivity: 1.0 V/lux-sec (550nm)

Software: OPTIKA Vision Lite for Windows XP/Vista/7, 32/64bit, Windows 8

Age Suitability: 11-18 Years

E8R05559

each **£491.95**

The digital camera allows the user to take great shots for future use.

Practical Information

- Ideal for class demonstrations with additional digital imaging capabilities
- Binocular head
- Up to 400X magnification
- Coaxial coarse and fine focusing
- White LED illumination with intensity control

Exceptional Science

Ideal For Further Education

3 Year Warranty

Bespoke Service Available

Optika Digital Compound Microscope B-150DBR

A fully functioning compound binocular microscope with additional digital imaging capabilities. A brilliant robust instrument that is suitable for experienced users who want to document their investigations.

Microscope Specification:

Light source type: white LED; light intensity control using a knob on left side of the frame. LED power: 1W. Colour temperature: 6300K LED average lifetime approximately: 50,000h. External power supply 100/240V, 50/60Hz; output: 6Vdc 2.5A. Internal NiMH rechargeable battery (up to 15 hours of use from a single charge, LED at medium intensity).

Observation Mode: Brightfield.

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 125 x 116mm, X-Y movement range 76 x 30. Specimen holder for one slide. Vernier scale on the two axes, accuracy 0.1 mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Binocular digital observation head, inclined 30° and rotatable 360°. Diopter adjustment on left eyepiece. Interpupillary adjustment 48-75mm.

Eyepieces: Widefield eyepieces WF10X/18.

Objectives: Achromatic (DIN) objectives with mechanical tube length 160mm;

- 4X, A.N. 0.10, W.D. 18mm
- 10X, A.N. 0.25, W.D. 7mm
- 40X, A.N. 0.65, W.D. 0.53mm

All objectives are treated with an anti-fungus treatment.

Condenser: Abbe condenser, N.A. 1.2 pre-centred.

Dimensions: H350 x W170 x D210mm.

Weight: 4kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Digital Camera Specification:

Image format: 2048 x 1536 pixel (3.14Mpx)

Pixel size: 2.8µm x 2.8µm. Sensor 1/3.2" CMOS

Output: USB 2.0 port.

SNR 42.3dB. Dynamic Pro Range 71dB

Exposure Time 20s - 1/1000s

Effective digits 10bit - on chip

Sensitivity: 1.0 V/lux-sec (550nm)

Software: OPTIKA Vision Lite for Windows XP/Vista/7, 32/64bit, and Windows 8

Age Suitability: 11-18 Years

E8R05560

each £719.95

Practical Information

- Ideal for advanced and Post 16 students
- Binocular head
- Up to 1000X magnification
- Coaxial coarse and fine focusing
- X-LED type with white LED illumination

3 Year Warranty



Carrying handle



Mechanical sliding stage

Optika Microscope 1000X Illumination B-292PLI

This instrument is great for routine applications. Dye-cast frame, with high stability and ergonomy, for transmitted light observation.

Microscope Specification:

Illumination: Light source X-LED type with white LED; light intensity control using a knob on left side of the frame. LED power 3.6W, comparable to a 30-35W halogen bulb. Colour temperature: 6300K. LED average lifetime approximately: 50,000h.

Voltage: external power supply 100/240Vac, 50/60Hz; output: 6Vdc 1A. Max. required power: 7W.

Observation Modes: Brightfield

Focusing: Coaxial coarse and fine focusing mechanism (graduated, 0.002mm) with upper stop, to prevent the contact between objective and specimen. Adjustable tension of coarse focusing knob.

Stage: Double layer with mechanical sliding stage, size 150 x 133mm, X-Y movement range 75 x 50mm, specimen holder for one slide. Belt drive in X direction. Vernier scale on X-Y axes, accuracy 0.1mm.

Nosepiece: Quadruple revolving nosepiece, rotation on ball bearings.

Head: Binocular observation head, inclined 30° and rotatable 360°. Diopter adjustment on left eyepiece. Interpupillary adjustment 48-75mm.

Eyepieces: Widefield eyepieces WF10X/20

Objectives: Infinity-corrected E-Plan objectives:

- 4X, N.A. 0.10, W.D. 18mm
- 10X, N.A. 0.25, W.D. 7mm
- 40X, N.A. 0.65, W.D. 0.53mm
- 100X, N.A. 1.25, W.D. 0.13mm (oil immersion)

All objectives are treated with an anti-fungus treatment.

Condenser: NA1.25 Abbe condenser, sliding-in, centrabile, up-down adjustment by rack and pinion.

Dimensions: H370 x W235 x D290mm. Weight: 6.5kg.

Accessories: Instruction manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Age Suitability: 11-16 Years

E8R05565

each **£599.95**



Practical Information

- Ideal for advanced and Post 16 students
- Can be used for class demonstrations
- Binocular head
- Upto 45X magnification
- 1.3MP camera
- Incident and transmitted 12V/15W halogen illumination

Exceptional Science

Ideal For Further Education

3 Year Warranty

Bespoke Service Available

Optika Digital Compound Stereo Microscope SZM-D

Microscope Specification:

Head: Binocular

Objectives: 0.7-4.5X Zoom

Stand: Pillar stand

Illumination: Incident and transmitted 12V/15W halogen with separated brightness control.

Accessories Manual and dust cover included. Instrument is supplied with both UK and EURO plug leads.

Digital Camera Specification:

Resolution: 1280 x 1024 pixels (1.3 mega pixels)

Sensor: CMOS 1/2". Pixel Size: 5.2 μm x 5.2 μm

Imaging Area: 6.67mm x 5.33mm

Frame Rate at Full Resolution: 7.5 frames/sec

Optical Format: 1/2". Aspect Ratio: 5:4

S/N Ratio: max 45 dB, Dynamic Range: 68.2 dB

ADC: 10 bit. Data Output (Uncompressed Video): 3x8 bit

Exposure Range: 0-70 msec. Sensitivity: 1.0V/Lux-second

C-Mount Lens Adapter: No

System Requirements: Windows 2000/XP SP2/Vista/7 32bit, and Windows 8

Software: Optika Vision Lite

Capture Features: Continuous auto white balance, continuous auto exposure.

Included with the camera: Optika Vision® software package, 1.5m USB cable

Age Suitability: 16 Years +

E8R05561

each **£947.95**



Practical Information

- Innovative design
- Excellent for teacher demonstrations
- 8.9" touch screen
- 3 mega pixel camera

Exceptional Science

Innovation

2 Year Warranty

TABLET TECHNICAL SPECIFICATION

Model	Tablet 8.9"
Operating system	Windows 8.1 32-bit
Language	Multi-languages already installed
Image capturing software	Optika Vision Lite
CPU	Intel® Bay Trail Z3735F, Quad Core
CPU speed	1.83 GHz
Graphics card	Intel® HD Graphics LPDDR3 controller
Memory	Ram 2,048 GB LPDDR3
LCD display	LED 8.9" IPS multi touch screen
LCD resolution	1920 x 1200 Full HD, Active Matrix TFT Colour LCD
Storage	Hdd 16+ 16GB
Network	Wireless IEEE 802.11 a/g/n Bluetooth 4.0
Input/output ports	Micro USB-B, Microphone, Micro SD card reader, Micro HDMI, headphone
Control buttons	Auto rotate off, volume control
Battery technology	Lithium-ion battery, 2x cell
Battery capacity	6000 mAh
Max load	10W
Battery life	up to 10 hours, up to 5.5 hours in continuous camera live view mode
Dimensions	Thickness 9.5mm, Height 157mm, Width 220mm
Weight	477g
Cables included	OTG cable, USB camera cable
Also included	Instruction manual, keyboard, touch pen and touchpad

CAMERA TECHNICAL SPECIFICATION

Digital camera resolution	3.14 MegaPixels
Analog camera resolution	No
Signal output	USB 2.0
Audio signal	No
Sensor size	1/4"
Sensor technology	CMOS
Image format	4/3
Full Image size	2048 x 1536
Pixel size	3.2 x 3.2 micron
Frame rate full resolution	6.5 frames/sec (2048 x 1536)
Frame rate other resolutions	28 frame/sec (1024 x 768) 55 frames/sec (640 x 480)
Sensitivity	1.0 V/Lux-second (550nm)
Signal/noise ration	43 dB
Dynamic range	61 dB

Philip Harris 8.9" Tablet

A brilliant innovation in microscopy, a tablet PC that has an in-built camera allowing it to be used with our microscope instruments. Perfect for the educator who is an innovator in the classroom too. Includes: Instruction manual, touch pen, keyboard with touchpad. The tablet can be connected to the Trinocular Microscope.

Age Suitability: 11-18 Years

E8R06359

each £659.95

Great Value

Buy the Philip Harris Tablet and Trinocular Microscope together and save.

E8R05952

set £1061.95



Philip Harris Economy Monoscope

This is a great introductory instrument for beginners to microscopy. This is a monocular version of the traditional stereo microscope. Provides basic features and functionality for users to get to grips with the principles of microscopy, feel more comfortable using microscopes and exploring the micro world around them.

Head: Monocular 45° inclined, 360° rotating.

Eye-piece: WF 10X/16mm.

Nosepiece: Fixed.

Objectives: 2X.

Total magnification: 20X.

Stand: Pillar stand.

Stage: Low position stage with clips.

Focusing: Rack and pinion of the optical head part.

Illumination: Without illumination.

Accessories included: dust cover, manual instructions.

E8R05716

each £71.95

Practical Information

- Ideal for transition students and beginners
- Monocular head
- Upto 20X magnification
- Rack and pinion focusing
- No illumination



A Dino-Lite AM4113T Pro USB Microscope

The AM4113T Pro USB microscope provides professional resolution images (1280 x 1024) and offers 10X to 50X and 200X magnification, adjusted via a convenient thumbwheel. The objective is surrounded with 8 bright white LEDs, which can be turned on/off in software, to illuminate the object. The MicroTouch sensor can be used to trigger the capture function for extra flexibility. The microscope supports real-time video and can capture video at 15fps, or up to 30fps at lower resolutions. Time-lapse video can be recorded and played back at frame rates of your choosing. Software and mini desktop tripod included.

System requirements: P4 1.5GHz, Windows 7/Vista/XP, MacOS 10.4 and above (MicroTouch not supported), 256MB RAM, USB2.0 port.

1/3" 1.3MPixel image sensor for sharper image quality. MicroTouch snapshot sensor, measurement and calibration tools in the DinoCapture software.

E8R03142

each **£350.95**

B Dino-Lite AM2111 USB Microscope

The AM2111 USB microscope provides VGA resolution images (640x480) and offers 10X to 50X and 200X magnification, adjusted via a convenient thumbwheel. The objective is surrounded with 4 bright white LEDs to illuminate the object. Real time video can be captured at up to 30fps, time-lapse video can be recorded and played back at frame rates of your choosing. DinoCapture software and mini desktop tripod included.

System requirements: P4 1.5GHz, Windows 7/Vista/XP, MacOS 10.4 and above, 256MB RAM, USB2.0 port.

E8R03141

each **£138.95**

C Dino-Eye AM4023X Microscope Eyepiece Camera

The Dino-Eye is a camera specially adapted to replace the optical eyepiece in a microscope, turning it into a digital microscope. It includes adaptors so it can fit microscopes with 23, 30 or 30.5mm eyepieces. The 1.3MP resolution image sensor (1280 x 1024) can capture video at 15fps, or up to 30fps at lower resolutions, through a USB 2.0 connection. The Dino-Eye approximates to a 20X eyepiece meaning that a 10X objective would give you the same view as a 10X eyepiece and 20X objective. The included DinoCapture software features facilities for annotating images with text and simple shapes such as lines, boxes and circles. Software measurement facilities with calibration are included for accurate measurements of subjects such as cells. Single images and real-time video can be captured, and time-lapse video can be recorded and played back at frame rates of your choosing.

System requirements: P4 1.5GHz, Windows 2000/XP/Vista, MacOS 10.4 and above, 256MB RAM, USB 2.0 port.

E8R03143

each **£230.95**

Dino-Lite
Digital Microscope



A Dino-Lite AM4515T8 Edge Microscope

This high magnification Dino-Lite model reveals details as small as 1.5 micrometer (µm). It also features a greater working distance at high magnification making it easier to watch and move very small objects under the microscope. The Dino-Lite AM4515T8 is bundled with the user-friendly DinoCapture 2.0 software which includes functions such as automatic magnification reading (AMR), calibration, measurement, capturing and annotating images, and record video. Although the AM4515T8 model can be operated handheld, a high-precision stand is recommended.

Features:

- Resolution: 1280 x 1024 pixels (1.3MP)
- Magnification: 700-900X
- Interface: USB 2.0
- 8 white light LEDs
- Output: Picture, Video, Time-lapsed video
- Filter/Diffuser: IR cut-filter 650 nm
- Compatibility: Windows XP / Vista, Windows 7 / 8 / 8.1
- Software: DinoCapture for Windows

E8R05717

each £659.95

B Dino-Lite AM4815ZT Edge Microscope

The Dino-Lite Edge provides superior image quality and a high level of flexibility due to the adaptable cap design. The built-in adjustable polarizer reduces glare and reflection on shiny objects. Extended Dynamic Range (EDR) feature, the details of darker or brighter areas within the object can be revealed by stacking images at different exposure levels. The Extended Depth of Field (EDOF) feature automatically stacks images at different focus level to improve the depth of field on rough or uneven surfaces. Different caps are supplied with the microscope making the Dino-Lite Edge the perfect choice for any professional application.

Features:

- 1.3 Megapixel resolution
- 20-220X Magnification and Polarizer (anti-reflection)
- Interface: USB 2.0
- 8 white light LEDs
- Output: Picture, Video, Time-lapsed video
- Video Frame Rate: Up to 30 frames-per-second
- Filter/Diffuser: Built-in polarizer
- Compatibility: Windows XP / Vista, Windows 7 / 8 / 8.1
- Software: DinoCapture for Windows

E8R05718

each £743.95

C Dino-Lite AM5116ZT Microscope

The Dino-Lite AM5116ZT connects directly to a VGA screen via a VGA (D-SUB) connector. It offers a high frame rate of up to 60fps at 1024x768 (XGA) resolution, resulting in crystal clear images. The AM5116ZT is the ideal choice in situations where real time images are vital, such as working on PCB's or other miniature objects. By tapping the Microtouch sensor on the microscope, the image can be frozen for inspection of important details and by pressing the Microtouch sensor for 2 seconds the LEDs can be switched on and off. The built-in adjustable polarizer reduces glare and reflection on shiny objects, such as metal surfaces, electronics, plastics etc.

Features:

- Resolution: 1024 x 768 pixels
- Magnification: 10X - 70X, 200X
- Interface: VGA (D-SUB) Connector
- 8 white light LEDs
- Output: Video
- Video Frame Rate: Up to 60 frames-per-second
- Filter/Diffuser: Built-in polarizer
- Direct VGA connection
- 0-70, 200X Magnification, with lock

E8R05719

each £539.95



D Dino-Lite RK-10A Microscope Stand

The Dino-Lite RK-10A is a sturdy and stable high-end stand solution that can be used with all the professional Dino-Lite models. It is constructed of resilient stainless steel and lightweight aluminum and offers a very precise fine-focus adjustment as well as a quick release function.

The quick release button allows for fast and convenient vertical movement and the fine-focus adjustment knob is especially useful at high magnification. This model also includes an adjustable safety stop to prevent the microscope from touching the specimen. Its adjustable horizontal arm has a 15cm range with 360-degree rotation and the additional arm (included) increases its effective range to observe larger objects.

Size: W15 x L22 x H23cm. Compatible with all Dino-Lite models.

E8R05721

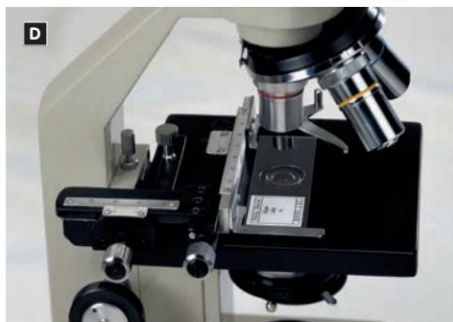
each £287.95

E Dino-Lite MS35B Microscope Stand

This robust and versatile pole stand provides an extremely flexible stand solution for the Dino-Lite microscope range. The focus block is positioned along the vertical pole by way of a thumbscrew and at its maximum height provides up to 23cm of working distance. A fine focus wheel on the side of the focus block provides up to 50mm of fine height adjustment. The additional feature of a ball and socket head attachment for the microscope holder enables the microscope angle to be adjusted. Compatible with all Dino-Lite models.

E8R05720

each £131.95



A Haemocytometer, Improved Neubauer Pattern

For estimating particles in suspension; this slide is designed for routine counts of red cells and white cells in blood but can also be used for counting bacteria or yeast cells. The cell has two counting grids, separated by a central trough and divided into 400 squares $0.05 \times 0.05\text{mm}$. With the special coverslip in place a volume of $2.5 \times 10^{-4}\text{mm}^3$ overlies each square. This enables numbers of cells per unit volume to be determined. Supplied complete with 2 special coverslips.

E8A76478

each **£127.95**

B Lens Cleaning Tissues

For non-abrasive cleaning of delicate optical surfaces. Lint-free paper, in sheets of $100 \times 150\text{mm}$ size. Contains 20 books of 100 sheets.

E8R05591

pack **£59.95**

C Microscope Dust Cover

To fit Philip Harris and Optika microscopes.

E8A75504

each **£3.59**

E8R00511

pack 10 **£27.95**

D Graduated Mechanical Stage

It is constructed for right hand access to both adjusting knobs, is calibrated in 1mm increments and accommodates all slide sizes. Range of operation $30 \times 55\text{mm}$, Vernier scale reads 0.1mm.

E8A75401

each **£30.95**

Microscope Slide Boxes

Easily access slides, with friction-fit cover. Slide boxes are perfect for storage or transportation of standard size slides. Available with either 25 slide slots ($141 \times 88 \times 35\text{mm}$) or 100 slide slots ($208 \times 175 \times 34\text{mm}$).

E E8R04537

25 Slides

each **£4.19**

F E8R04538

100 Slides

each **£8.59**



A Cover Glasses

Number: 11/2. Thickness: 0.160/0.190mm. Boxes of 100.

E8R01766	16mm diameter	box 100	£5.99
E8A76302	22mm diameter	box 100	£23.95
E8A76314	18 x 18mm	box 100	£2.49
E8A76326	22 x 22mm	box 100	£1.44
			£2.39

B Microscope Slides - Cavity

Size: 76 x 26mm, thickness: 1.2mm.

E8A76284	box 10	£7.49
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Microscope Slides - Ground Edge

Good quality glass slides with ground edges. 0.8 to 1.00mm thick.

Size: 76 x 26mm.

E8A76259	box 100	£5.99
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Microscope Slides

A more robust slide for general classroom use. Good quality glass 1.0 to 1.2mm thick. Size 75 x 38mm.

E8A76272	box 100	£23.95
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Microscope Slides - Plain

Size: 76 x 26mm, edges ground.

E8A76260	box 100	£6.59
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C Optika Micrometric Slide

26 x 76mm micrometric slide. Range 1mm, div, 0.01mm.

E8R05590	each	£55.95
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D Film Reticles

Plastic film reticle strips, 5 images per strip, 2 strips per pack - total 10 images, scale 10mm length with 100 divisions of 0.1mm, overall size 150mm x 30mm x 0.18mm thick, guide circles of 16mm, 19mm, 21mm and 24mm around each scale image for cutting.

Direct Delivery - up to 10 days

E8R05955	pack	£39.95
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A Nature Viewer

A clear plastic sample box with a magnifying lid. A grid on the base of the box allows the specimens to be measured. Magnification: 4.75X. Dimensions: 75 x 60mm diameter.

E8A25446 each **£7.79**

B Bug Pots

Plastic viewers with 2X lenses and grid printed on the base. Diameter: 50mm.

E8R06074 pack 10 **£7.39**

C Magnifiers

High quality glass lenses with moulded plastic handles.

Lens Diameter	Magnification	
E8L31392	38mm	4X each £2.99
E8L31409	50mm	3.5X each £3.59
E8L31422	75mm	2.25X each £4.49
E8L31434	90mm	2.25X each £6.49

D Magnifier with Handle

A biconvex lens, 2X magnification, mounted in a black plastic handle.

Lens Diameter	Overall Length	
E8A72564	48mm	120mm each £3.69
E8A72588	85mm	195mm each £7.39

E Magnifiers

High quality glass lenses with moulded plastic handles.

Lens Diameter	Magnification	
E8A72503	50mm	4X pack 5 £8.69
E8E95025	32mm	5X pack 10 £7.79

F Magnifier Set

This 35 piece set contains a variety of magnifying instruments which can be used for a selection of experiments. The magnifiers are of differing strengths and allow for many areas of experimentation.

E8R06033 set **£39.95**

G Double Lens Magnifier

The main 50mm lens is 4X magnification and the 21mm secondary lens is 6X magnification. Pack of 10.

E8R06032 pack 10 **£19.95**

H Pocket Magnifier

Lightweight magnifier with two plano-convex lenses. Lens mount folds into case. Dimensions: 15 x 25mm. 10X magnification.

E8R02332 each **£2.49**

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A



B



C



A Animal And Plant Cell Pack

The soft foam cells split in half to show the key parts of an animal and plant cell. The animal cell shows the Nucleus, Nucleolus, Vacuole, Centrioles, the Endoplasmic Reticulum, Golgi Apparatus, Ribosomes and Cell Membrane. The animal cell shows the main organelles including the Mitochondria, Chloroplasts and Vacuole.

One hemisphere is labelled with the parts of the cell; the other features only letters next to each cell part, making it a natural tool for testing and assessing student comprehension. An Activity Guide is included, providing activity ideas and facts about animal cells. Each cell measures 130mm in diameter.

E8R02001

set **£36.95**

B Mitosis Model

A robust plastic model showing 8 stages of mitosis. The model is carefully coloured for maximum clarity and teaching value. Each stage is numbered and a key is attached. Base size 330 x 390mm.

Direct Delivery – up to 4 weeks

E8R05615

each **£119.95**

C Meiosis Model

10 stages of the process of meiosis are depicted on this unique and high quality model. Each stage is expertly hand painted and mounted on a perspex base. Base size 330 x 390mm.

Direct Delivery – up to 4 weeks

E8R05614

each **£143.95**

**A The Cell Print Set**

The set comprises of twelve specially selected electron micrographs highlighting the main ultrastructural features of plant and animal cells. Key features are labelled randomly A, B, C etc making the set ideal for both teaching purposes and testing knowledge of ultrastructural details.

Compiled by Dr. A. W. Roberts, Department of Biology, University of York. High quality. Prints on artboard size: 259 x 203mm.

E8A04662

set **£6.59****B Cell Structure Resource Pack**

Designed to assist students in their understanding of cells, the pack provides an ideal introduction to the similarities and differences between plant and animal cells. The models are detailed enough to also be of use in advanced studies on cell structure and are supplied unpainted (with the exception of the chloroplast). Model sizes: Plant Cell: 160 x 155 x 70mm, Animal Cell: 150 x 130 x 70mm.

Contents:

- 2 detailed cell models, 1 plant and one animal
- 12 electron micrographs
- Copyright-free line drawings
- Teacher's guide

Direct Delivery – up to 6 weeks

E8A04650

pack **£227.95****C Meiosis Model Set**

A set of ten models to depict the stages of meiotic division. Chromosomes are painted for clarity. The teaching notes include photocopyable work sheets and unlabelled diagrams. The models are particularly suited for GCSE level but will also be found useful at higher levels.

Direct Delivery – up to 6 weeks

E8A04832

set **£239.95****CURRICULUM LINKS**

- Structure and function of living organisms, specifically cells and organisation

A



A Adult Organ Tunic

This highly tactile resource is an adult-sized version of the popular Organ Tunic. There are 11 Velcro-on 3D organs and it is embroidered with a pelvis, spine and 3D ribcage. The intestine may be unravelled to show its length. Includes a set of ten detailed labels and a reference sheet.
Size 700 x 480mm.

E8L03384

each **£127.95**

B Human Foam Body Set

Set of five foam cross-section models of different body parts. The models separate into halves - one with labels and the other with letters for self-checking. Models measure approximately 130mm and come with activity guide. Set includes Brain, Heart, Ear, Eye and Tooth.

Description	Length	Width	Height	Weight
Heart Model	160mm	145mm	147mm	490g
Brain Model	163mm	145mm	145mm	350g
Tooth Model	144mm	157mm	145mm	250g
Ear Model	170mm	100mm	100mm	550g
Eye Model	NA	120mm	NA	45g

E8R02000

set **£87.95**

C Human Body Cube

A book of the human body in the form of a cube. Tactile, rip-resistant and durable. Guided by the arrows, start and stop dots the cube can be opened and folded in a series of ways to show each "page". This cube contains full colour detailed and labelled pictures of all of the body's major systems: circulatory system, brain, eye, ear, heart, lungs, digestion system, muscular system, skeletal system, kidneys and nervous system.

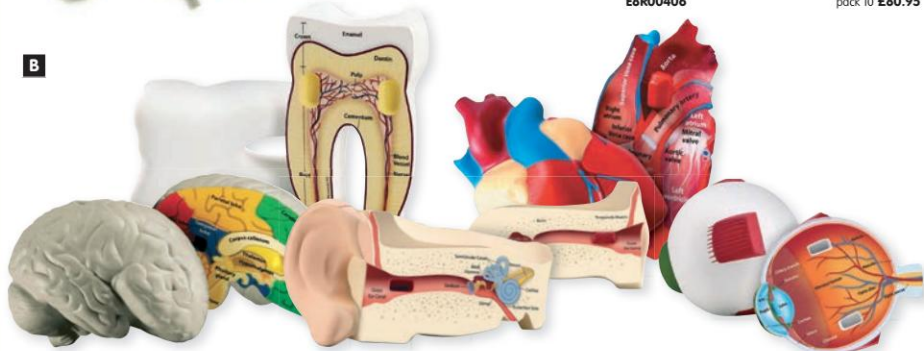
E8H47701

each **£8.39**

E8R00406

pack 10 **£80.95**

B



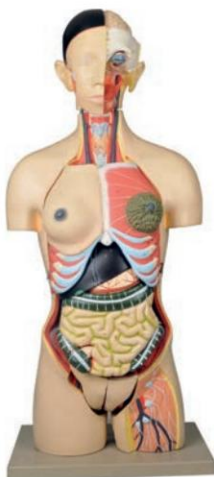
C



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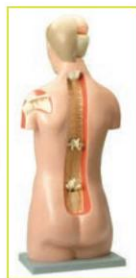
A



B



C



D



A Dual Sex Torso, 24 Parts

High quality Dual sex torso with open back fully represents the anatomy of the complete human upper body. Life size cut away spine showing the head with nasal and buccal cavity, half brain, eye with optic nerve. Removable female breast with rib insertions, heart in 2 parts, 2-lung halves, liver with gall bladder, 2-part stomach, large and small intestines with appendix flap opening and cover, half of kidney. Male genital organs in 4-parts and female genital organs in 2-parts with embryo in the 3rd month of pregnancy. The back shows the vertebral column, spinal cord with nerve endings and the 7th dorsal vertebra is removable. Mounted on a base. Numbered with English Key Card. Size 38 x 24 x 89 cm approx. Weight 7.5 kg approx.

E8R05982

each **£587.95**

B Half Size Black Torso Model

Half size black model dissectable in 9 parts by removing lungs and heart - 2 parts, stomach, liver and gall bladder, intestine 2 parts. Mounted on base numbered with English keycard. Size 25 x 18 x 45cm approx. Weight 1.7kg approx.

E8R05983

each **£119.95**

C Human Torso Model, 17 Parts

This torso has its back and shoulder open. 1 cervical vertebra, thoracic vertebra, lumbar vertebra are provided. The following parts are removable - 1 part cerebrum with cerebellum and brain stem, 2 parts lungs, 2 parts heart, 1 part liver, 1 part pancreas and duodenum, 2 parts stomach, 1 part large and small intestine, 1 part cecum cover, 1 part right half kidney, 1 part half bladder, 1 part cervical vertebra, 1 thoracic vertebra, 1 part lumbar, 1 part eye ball. Made of high quality PVC. Mounted on a base. Dimensions: 38 x 24 x 89cm.

E8R04612

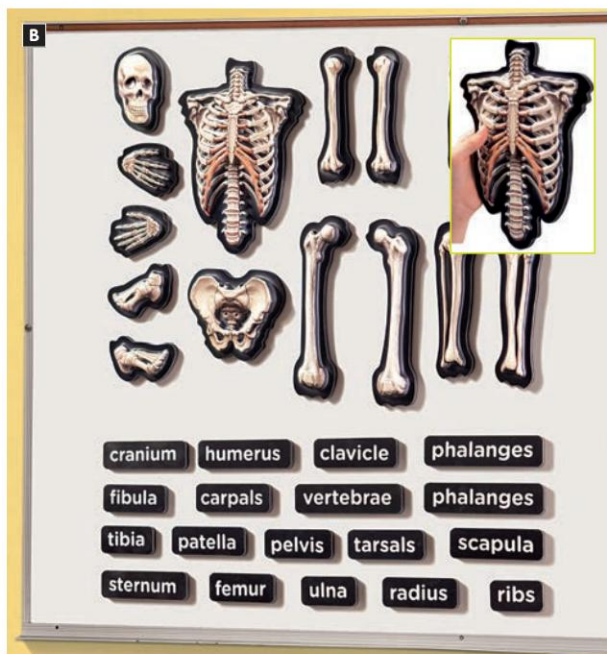
each **£191.95**

D Human Torso Model, 11 Parts

This half-size torso can be dissected into 11 anatomical parts. Ideal for use in the classroom to demonstrate the relationship between internal organs. Includes a key to the parts. 500mm high.

E8R03265

each **£61.95**



A Human X-Ray Print Set

Set of 23 X-ray prints on twelve sheets, with explanatory notes.

E8A22639

A4

set **£16.95**

E8A22640

A3

set **£18.95**

B Magnetic Skeleton

Build magnetic science models on your whiteboard large enough for the whole class to see! Assemble the chunky 3-D pieces in demonstration, then let students try it later to test their knowledge. Includes 15 pieces detailing the major bones of the human body, 18 magnetic labels, plus Activity Guide. Measures 90cm once assembled.

E8R03266

each **£51.95**

C Human Skull 3 Part

A detailed reproduction of a life size human skull with all structural details. The skullcap is removable to show the internal structure of the skull. The mandible is articulated and removable. All of the joints, sutures, fissures, foramina and processes are accurately portrayed. Size: 220 x 140 x 160mm. Weight approx. 950g.

E8R05417

each **£46.95**



CURRICULUM LINKS

- Structure and function of living organisms, specifically the skeletal and muscular systems

A Half Size Skeleton

An inexpensive half size scale model of the human skeleton. Supplied complete with stand, dust cover and information leaflet labelling all parts in detail. The top of the skull may be removed and the main joints are articulated, with hands and feet moulded in a single piece. 850mm high.

E8A22869

each £57.95

B Human Muscular Skeleton with Stand

This model is a replica of a life size human skeleton showing all parts in excellent detail. The main joints are articulated and the left side of the skeleton shows the attachment points of some muscles. Supplied with a 5-castor roller stand for easy movement around the classroom. This resource represents excellent value for money.

Height: 1.7m.

Weight: approx 10kg.

E8R02032

each £359.95

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With joint ligaments

A Human Skeleton with Ligament

The life-size model of a human skeleton provides an incredibly high amount of realism and detail for students examining the human skeleton. The right half features shoulder, elbow, hip and knee joint ligaments. The skeleton is made of a fibrous material and is mounted on a stand with free rolling wheels. Supplied with dust cover. Size: 170cm.

E8R05976

each £395.95



B Human Skeleton With Stand

This model is a replica of a life size human skeleton showing all parts in excellent detail. It is hand-assembled for durability. The main joints are articulated, the upper and lower limbs can be removed easily. The following parts are detachable: calvarium, skull, jaw, arms, legs. Supplied with a 5-caster roller stand.

Height: 1.7m. Weight: approx 10kg.

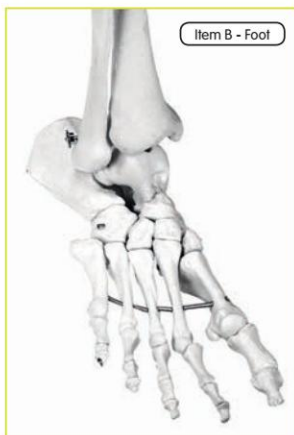
E8R02098

each £209.95

Human Skeletons

The replica skeletons are cast from natural bone skeletons in an unbreakable plastic.

All anatomical details are carefully reproduced. These replicas are particularly suitable for courses in biology, human biology, health education, and have also proved acceptable for physiotherapy and other para-medical courses.





A Interactive Human Anatomy Chart

Bring your wall to life with this amazing Human Anatomy 3D Chart. Watch as the human anatomy leaps from the poster as you can explore and interact with the heart, brain, digestive system, and more using the free bonus app! This chart is infused with Augmented Reality technology allowing your students to engage and learn through detailed 3D animations, educational videos, and informative facts. These key features will help your students enhance their creative perception, learn about spatial and temporal concepts, and retain information. Enable your students to learn differently with the Human Anatomy chart, bringing learning to life in the classroom. Poster Size: 107 x 81cm. Download your free app on Android (via Google play) or iOS (via the App Store).

E8R06014

each £47.95

B Anatomical Leg Muscles

This life size model shows the musculature of the human leg in detail. It shows superficial and deep muscle structures, vessels, nerves and ligaments. The model shows foot, lower and upper leg as well as a half pelvis. Supplied with stand and manual.

- Single muscles can be removed for closer study:
- Tensor fasciae latae
 - Plantar aponeurosis
 - Extensor digitorum longus
 - Rectus femoris
 - Semitendinosus and semimembranosus
 - Gracilis
 - Gluteus medius
 - Gastrocnemius
 - Soleus
 - Gluteus maximus
 - Long head of biceps
 - Sartorius

Direct Delivery – up to 4 weeks

E8R06004

each £635.95

C Circulatory System Model

A detailed representation of the human circulatory system in one-half scale. Trace blood flow away from the heart through the arteries and capillaries to all areas of the body and back to the heart through the veins. Frontal plane is cutaway so blood circulation can be traced to the major organs and extremities. Mounted on a 32" x 12" base, includes key card. Size: H7 x W30 x 101cm.

E8R05977

each £94.95

D Anatomical Arm Muscles

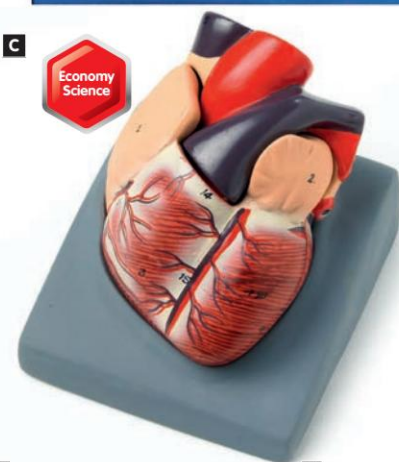
This life size model shows the musculature of the human arm in detail. It shows superficial and deep muscle structures, vessels, nerves and ligaments. The model shows hand, lower and upper arm as well as shoulder girdle. Supplied with stand and manual.

- Single muscles can be removed for closer study:
- Palmar aponeurosis
 - Brachioradial muscle with radial extensor muscle
 - Long palmar muscle with radial flexor muscle
 - Triceps muscle
 - Biceps muscle
 - Deltoid muscle

Direct Delivery – up to 4 weeks

E8R06003

each £407.95



A Vein and Artery Model

Greatly enlarged plaque model, featuring a typical vein and artery, sectioned to indicate the various layers and the depth of penetration of the vasa vasorum. With the vein sectioned to show valves, the arterial and venous nerve network clearly shown for comparison, and including arteriovenous anastomoses. On base 280 x 305mm, complete with key card.

Direct Delivery – up to 4 weeks

E8R05597

each **£137.95**

B Occluded Artery Model

Ten times larger than life-size, this see-through artery model shows a constricted artery clogged with plaque. When the model is turned over, life like red blood cells have difficulty flowing through the small opening, just as they would in an artery with atherosclerosis. Model is made from durable plastic.

Dimension: 70 x 170mm.

E8L87464

each **£74.95**

C Economy Heart Model, 2 Part

2 times enlarged. Dissectible into 2 parts showing clearly the blood vessels. Structure of auricles and ventricle on diaphragm. Numbered with English key cards.

E8R04615

each **£29.95**

D 3D Pumping Heart

A three dimensional operating plastic heart with transparent chambers. Complete with assembly instructions and acrylic paint.

Size: 250mm high.

E8H34974

each **£13.95**

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A Ruby Stethoscope

A lightweight stethoscope manufactured from the finest materials machined to the most exacting tolerances. It is designed to ensure superb acoustic performance and maximise comfort. Features a dual purpose chest piece.

E8R05601 each **£9.59**

B Pedometer

A stylish, slim and advanced technology activity monitor. Unlike traditional pedometers, the Tanita PD-724 utilises advanced 3-Axis technology to give a more accurate and reliable fitness measurement. The PD-724 measures and records distance, steps, calorie count and activity time to give you feedback on your daily activities and exercise. It includes a seven-day memory facility so that you can monitor and review your daily and weekly totals. This advanced pedometer also features a 'fat burned' measurement and allows you to enter your own targets for increased motivation.

The PD-724 is accurate, convenient and discreet - it does not have to be clipped to a waist band, it is just as accurate when hung from a neck strap, or kept in your pocket or handbag. Other features include a large two-line display for easy viewing on-the-go and a safety alarm.

This easy-to-use, feature-packed pedometer is the ideal choice for those who want to stay motivated and keep track of their daily activity.

Specifications:

- Step counter
- 24-hour clock
- Stopwatch
- Distance (kilometres only)
- Activity timer
- Calorie counter
- Seven-day memory
- Safety alarm
- 'Fat burned' feature
- Motion sensitive adjustment
- Easy-to-read two-line LCD Display
- Five-digit reading
- CR2032 lithium battery included
- Silver neck strap with detachable clip included
- Two-year manufacturers guarantee.

E8R06021 each **£33.35**

C Dual Head Training Stethoscope

As item A with addition of dual head designed specifically for teaching.

E8L87440 each **£21.95**

D Blood Pressure Monitor

Fully automatic blood pressure monitor. 13 digit LCD display Pressure indication range 50 to 250 mmHg (systolic 40 to 180 mmHg (diastolic) 40 to 160 pulses/min (pulse rate). 2 memory banks of 30 measurements each with averaging. Ideal for 2 users or for morning and evening recording. Very user friendly. 22-32cm arm circumference with standard cuff.

E8R06027 each **£59.95**

E Basic Wrist Blood Pressure Monitor

An easy to use, large display, basic blood pressure monitor with the following features:

- Measurement during inflation
- Large LCD
- Automatic inflation and deflation
- Seven sets of memory
- Three minutes power-off function
- Utility case for storage and hand rest
- Low battery indicator
- Requires 2 x AAA alkaline batteries

E8R00226 each **£47.95**

F Heart Rate Monitor

This easy to use heart rate monitor with pedometer is ideal for training and educational purposes. Clock functionality includes time, date, alarm and stopwatch with 40 laps whilst performance can be measured in steps, distance, calories, pace, speed and date, alarm and stopwatch with 40 laps memory and much more. This simple system will provide accurate and useable results.

E8R06197 each **£29.95**





A Instapulse

Extremely easy to use with a simple touch of the hands - just grasp the rings for an instant pulse reading. Automatically turns off when your hands are removed. Ideal for use in schools where a large group can easily share its use, before, during or after exercise.

E8R06026

each **£142.95**

B Body Composition Monitor

The Tanita BC731 with its compact glass design ensures easy storage. The large LCD easy-to-read display clearly shows all body composition measurements in seconds. With Athlete mode and a 5 user memory.

Specifications:

- 9 Measurements
- Weight 10-150kg / 100lb
- Body Fat % (0-1%)
- Physique Rating (9 silhouettes)
- Muscle Mass (kg)
- Visceral Fat (1-59)
- BMR (kcal/KJ)
- Total Body Water (%)
- Bone Mass (kg)
- Metabolic Age (12-90)
- Extra features
- Guest Mode
- Athlete Mode
- 5 Memory
- Recall Function
- Power supply 4 x AAA batteries (included)
- Weight of product only 1.4kg
- Dimensions of product only 210 x 297 x 25mm
- Manufacturers guarantee 3 years

E8R06028

each **£65.95**

C Blood Pressure Upper Arm large cuff

The Nissei DS-1902 Auto-Inflate Blood Pressure Monitor has eliminated inflation from cuff inflation by measuring at the time of inflation. Unlike regular blood pressure measurement that reads oscillation during inflation after cuff is inflated to a certain amount, the reading starts during inflation and it stops as the systolic blood pressure is taken, which is the end measurement, and the air in the cuff is rapidly exhausted immediately. The cuff inflation is so gradual and gentle that the measurement is done almost before you realize the inflation.

To achieve measurement in even less time, the DS-1902 features a 'Personal Mode'. With this 'Personal Mode', the inflation is carried out just to the appropriate amount, at the ideal rate, which is determined from the past three measurements.

The Nissei DS-1902 Auto-Inflate Blood Pressure Monitor features 'Irregular Pulse Rhythm Indication' to ensure correct measurement and to suggest the possibility of arrhythmias, and the wide cuff range enables it to be applied to arm circumference of 23 - 43cm without the need for a large cuff size.

E8R06030

each **£59.95**

D Upper Arm Blood Pressure Monitor

Clinically Validated to the latest, most stringent, ESH-2010 International Protocol and recommended for Clinical and Personal use.

Uses a specially preformed universal arm cuff for both standard and large arm circumferences (22 cms to 43 cms). No need for two separate cuffs, one size fits all. Controlled inflation pressure. The arm cuff only inflates to a pressure sufficient to obtain the Systolic Pressure reading, thereby avoiding discomfort caused by over inflation. Displays result on WHO classification chart to enable easy comparison with recommended values.

Irregular Pulse Rhythm displayed if detected. Monitor calculates and displays 'Pulse Pressure'. 2 memory banks each saving 60 readings and averaging the saved results.

E8R06029

each **£59.95**



A Nervous System Model

Model shows the brain and details of spinal cord and nerves in their position in the body. Mounted on a base, includes numbered English key cards.

Size: 1000 x 430 x 90mm.

E8R04623

each £59.95

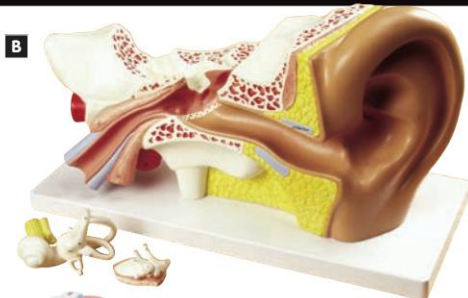
B Human Ear

This 4 part model shows the human ear enlarged approximately three times. It shows all the essential details of both the internal and external human ear, allowing for teaching of the ear as a collector and receiver of sound.

Size: 340 x 160 x 190mm.

E8A22019

each £59.95



C Human Brain Model

Life size 2 part model of the human brain. The model is a median section. The right hemisphere has the cerebellum and the stem with occipital lobe. Mounted on a base with numbered English key cards.

Size: 180 x 190 x 210mm.

E8R04622

each £28.95

D Economy Human Eye Model

This model is the upper half of the sclera with cornea and eye muscle attachments, both halves of choroids with the iris and retina, lens and vitreous humour are removable. Mounted on a base numbered with English Key Cards.

Size: 220 x 130 x 130mm

E8R04624

each £22.95



Direct
Delivery

Economy
Science

E Kidney and Adrenal Section

A 2x life size sectional model of the right kidney and adrenal gland, partially dissected. Mounted on base with key card.

Size: 100 x 60 x 170mm.

Direct Delivery - up to 4 weeks

E8R05600

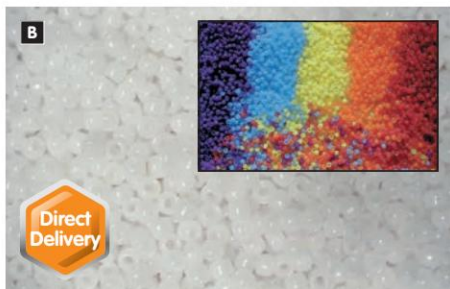
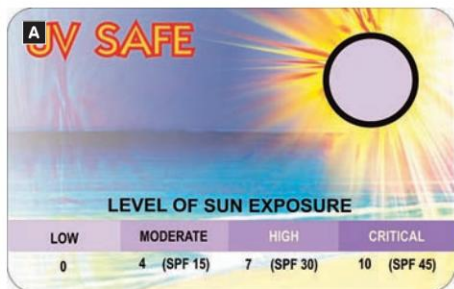
each £77.95

F Human Eye

3 times life size, this 6 part model shows the structure of parts like the lens, cornea and retina. The eye structure fasciculus and informs.

E8R06018

each £63.95



A UV Card

The UV Intensity card enables individuals to gauge the strength of the Sun's ultraviolet rays by giving a general measurement against a colour scale. The card incorporates a UV sensitive area that changes to a shade of purple when exposed to sunlight. This can then be compared to the purple printed scale which shows 4 levels from Low to Critical and an approximate UV Index. When there is bright sunshine the photochromic area will change to a dark purple but when it is cloudy the area will only change very slightly as ultraviolet rays can still penetrate clouds. The photochromic area takes about 15 to 20 seconds to take a reading and to settle.

E8R03270 pack 10 **£15.95**

B Ultraviolet Detecting Beads

A fun way to learn about the power of sunlight. As well as making bracelets, pupils are able to carry out fun experiments investigating solar radiation, effectiveness of sunscreen and sunlight. A science activity guide is included and allows children to carry out scientific investigations and learn about the effects of the sun on their health.

- Observe radiation from the Sun at different times of the day
- Test the effectiveness of glass in blocking the Sun's rays
- Test the effectiveness of different SPF sunscreen

A bag of white beads which turn into many different colours when exposed to an ultraviolet light source. Ideal for observing UV radiation from the Sun. Beads are drilled so that they can be threaded onto pipe-cleaners or string. A great way to raise awareness of the health issues associated with exposure to the sun.

Direct Delivery – up to 10 days

E8L87567 pack **£15.95**

C Excretory System Model

Natural size. Kidneys, ureters, adrenal glands and bladder with prostate as well as the large abdominal right kidney sectioned to show all anatomical details. Mounted on a base, numbered with English key cards. Size: L406 x W266 H76mm. Weight: 1.1kg.

E8R04626 each **£41.95**

D Economy Skin Section

Enlarged 70 times, full size, shows section through three layers of the hair covered skin of the head. Also shows hair follicles with sebaceous, sweat glands, receptors, nerves and vessels. Base mounted, with numbered English key cards. Size: L355 x W254 x H50mm. Weight: 1kg.

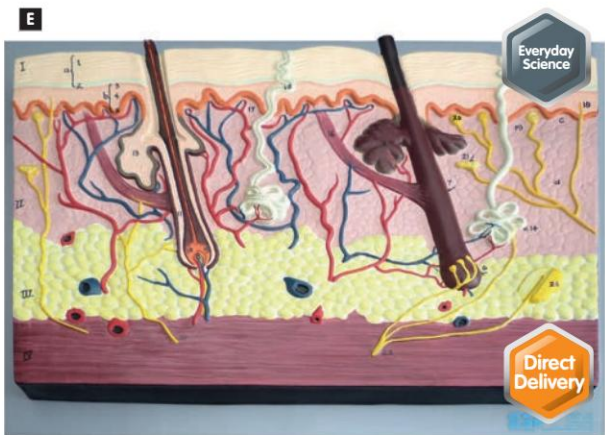
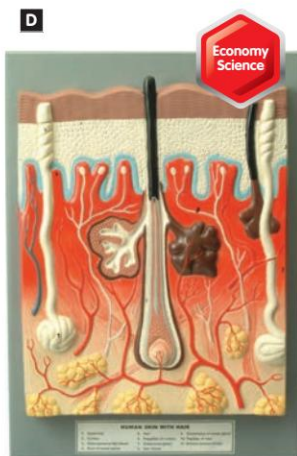
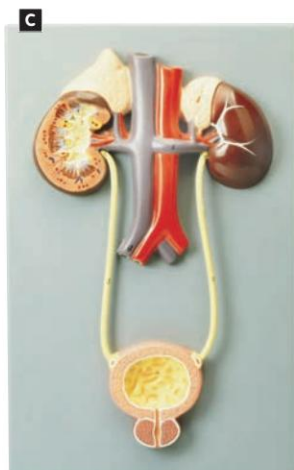
E8R04625 each **£29.95**

E Skin Model

A vertical section of skin, enlarged about 75 times. The section shows the different layers of the skin and passes through a hair follicle and shaft. Blood vessels, sebaceous glands and sweat glands are shown, as are the different nerve receptors. Mounted on base, with key card. Size: 350 x 280 x 40mm.

Direct Delivery – up to 4 weeks

E8R05599 each **£197.95**



Teaching Enzymes

Do you need access to the most comprehensive range of chemicals, experiment kits and ancillaries to teach Human and Animal Nutrition? If so, Philip Harris have everything that you need.

Enzymes are arguably the most important chemicals produced by living cells of plants, animals and macro-organisms. These macro proteins catalyse the vital chemical reactions that control life processes.

In the human digestive tract the enzymes Protease, Amylase and Lipase act to breakdown proteins, carbohydrates and fats from our food to form smaller molecules that can be absorbed into the bloodstream.

Enzymes also have wide commercial uses such as in the brewing and baking industries, cheese manufacture and fruit juice extraction and domestically in bioactive washing powders.

Philip Harris offer the widest range of individual enzymes – see pages 62 and 63

Fungal Amylase	Protease	Pectinase
Cellulase	Urease	Renninase
Lactase	Bacterial Amylase	Catalase
Pepsin Solution	Glucose Isomerase	Invertase Bioinvert
Urease Tablets	Pancreatin	Protease SA
Amylase Solution	Trypsin	Rennin
Invertase	Diastase	
Pepsin	Lipase	

Our enzymes set is a collection of the following enzymes: Fungal Amylase, Diastase, Lipase, Pancreatin, Pepsin, Trypsin, Urease, Invertase.

Introduction To Enzymes

This kit demonstrates the effects of pH and temperature and the specificity of enzymes. Emphasis is placed on good experimental technique and appropriate deductions from the results obtained. Suitable for GCSE or 'A' level. Sufficient for 30 students/groups.

Experiments included:

- Demonstrating enzyme activity
- Enzyme specificity
- The effect of pH
- The effect of temperature

Direct Delivery – up to 4 weeks

EBA01594

kit £57.95

CURRICULUM LINKS

- Content of a healthy human diet and its imbalances
- The tissues and organs of the human digestive system and their functions in it





A Enzymes Set

Eight tubes of 10g each of Amylase, Diastase, Invertase, Lipase, Pancreatin, Pepsin, Trypsin and Urease. With teaching notes.

Direct Delivery – up to 4 weeks

E8A02019

set **£59.95**

B The Effect of Temperature on Enzymes

In general the rate of a chemical reaction increases with rising temperature. This also holds true when the reaction is catalysed by an enzyme - up to a point. The fact that enzymes are complicated proteins and tend to become unstable under certain conditions, complicates the matter. This kit investigates these phenomena using the enzymes Amylase and Invertase.

Experiments include:

- Heat denaturation of Invertase
- Heat denaturation of Amylase
- Effect of incubation temperature on the activity of Amylase

Suitable for advanced or tertiary level students. Kit contains enough equipment for 10 single students or 10 small groups.

E8R03299

kit **£39.95**

C The Effect of pH on Enzymes

Enzymes are affected by pH in two ways. The first instance, electrostatic charges on groups of the enzymes active sites are modified, and, secondly those charges are responsible for holding the molecular shape and active configuration may be disrupted. Both of the above factors have significant influence on the catalytic properties of the enzymes.

These effects are illustrated using the enzyme Amylase and Invertase.

Experiments included:

- Effect of pH on Invertase activity
- Effect of extremes of pH on stability of invertase
- Effect of extremes of pH on stability of Amylase

Suitable for A-level or tertiary level students. Kit contains enough equipment for 10 single students or 10 small groups.

E8R03298

kit **£42.95**



Spares and Accessories

Exposed Film

Used as a substrate in proteolytic enzyme experiments. Supplied as 1.5m strip.

E8A01995

pack **£6.59**

Enzyme Buffers

Concentrated solutions as used in enzymology kits. x 5 concentrated (dilute 1:4).

Direct Delivery – up to 2 weeks

E8A02021	pH 2.8 50mL	each £6.79
E8A02033	pH 4.5 50mL	each £5.29
E8A02045	pH 4.7 50mL	each £6.29
E8A02057	pH 6.5 50mL	each £6.99
E8A02069	pH 7.0 50mL	each £6.19

Our Own Design

Digestion includes the action of breaking down the large molecules which cannot pass across membranes, into smaller constituent molecules that are able to diffuse into the bloodstream.

An appreciation of the structure of these large molecules and the role played by enzymes, is key to developing an understanding of this process.

This kit is perfect for helping your students to understand this process.



Digestion Enzyme Model

This kit helps students explore the role and function of enzymes in the digestion of the main food groups.

The model consists of:

- A selection of pieces that slot together to construct long chain carbohydrate and protein models and a lipid (fat) model
- Four pieces to represent key enzymes (carbohydrase, protease and lipase) as well as a piece to represent a 'de-natured' enzyme

The assembled carbohydrate, protein and fat model is used in conjunction with the enzyme models. Each enzyme features an 'active site'. This is key to accept one of the molecules, and to 'break apart' the model, releasing the smaller molecule shapes (sugars, amino acids, fatty acids and glycerol). The action demonstrates that enzymes behave as catalysts, participating in the breakdown process without being altered or consumed in the process and therefore are available to perform the action again.

The fourth enzyme model is used to demonstrate that under the wrong conditions (temperature, pH) enzymes may become 'de-natured', following which their active sites become unusable and they are no longer able to participate in the breakdown of the appropriate food group molecule.

E8R04630

kit £83.95

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RANGE
ONLINE AT**

www.findel-international.com

Product code	Enzyme	Quantity	Working Concentration	pH	Temperature °C
E8A01727	Fungal α Amylase	50g	0.1 - 1%	3 - 6	20 - 60
E8A01740	Bacterial Amylase	100mL	0.5 - 1%	5 - 7.5	70 - 95
E8F55885	Bacterial α Amylase	50g	0.5 - 1%	5.5 - 8.5	20 - 70
E8A01752	Amylase Working Solution	50mL	0.1 - 1%	3.5 - 5	
E8L12051	Catalase	50mL	0.5 - 2%	3 - 9	25 - 80
E8A01776	Cellulase	2g	1%	5.5	25
E8A01788	Diatase	100g	1 - 2%	3.5 - 5	20 - 60
E8A01799	Glucose isomerase	50g	Neat	6.0 - 9	55 - 70
E8A01806	Invertase	50mL	1 - 2%	4 - 6.5	40 - 65
E8A01818	Invertase 'Bioinvert'	50mL	1 - 2%	4 - 6	40 - 65
E8A01829	Lactase B (Beta-Galactosidase)	25mL	1 - 2%	6.5 - 8	35 - 50
E8A01831	Lipase	25g	5%	6 - 9	20 - 50
E8A01843	Pancreatin	100g	1 - 2%	5.5 - 8.5	20 - 50
E8A01867	Pectinase	100mL	0.1 - 1%	2 - 9	20 - 75
E8A01879	Pepsin	50g	1 - 2%	2 - 4.5	30 - 70
E8A01892	Pepsin stock solution	100	10%	2 - 4.5	30 - 70
E8A01909	Protease	100g	1 - 2%	5.5 - 7.5	30 - 60
E8A01910	Protease SA	50mL	0.2 - 1%	5 - 9.5	30 - 70
E8A01922	Rennet (Rennilase)	50mL	0.05 - 0.1%	5.5 - 6.5	30 - 50
E8A01946	Rennin	5g	0.05 - 0.1%	5.5 - 6.5	25 - 55
E8A01958	Rennin	25g	0.05 - 0.1%	5.5 - 6.5	25 - 55
E8A01969	Trypsin	25g	0.1 - 1%	5 - 10.5	20 - 65
E8F55897	Urease	25g	1 - 2%	6 - 9	20 - 70
E8A01983	Urease tablets	10 tabs	1 - 2%	6 - 9	20 - 70

Practical Information

ENZYME: STORAGE, SHELF LIFE, CONCENTRATION

It's good practice to store enzymes in a refrigerator (5°C approx). This should give a shelf life of 12 months, without significant loss of activity. All enzymes, as supplied, should be considered as 100%, e.g. Cellulase, supplied as 2g - 1g in 100mL gives the working solution 1% and Pectinase, supplied as 100mL - 1mL diluted to 100mL, gives a 1% solution.

Direct Delivery - up to 4 weeks

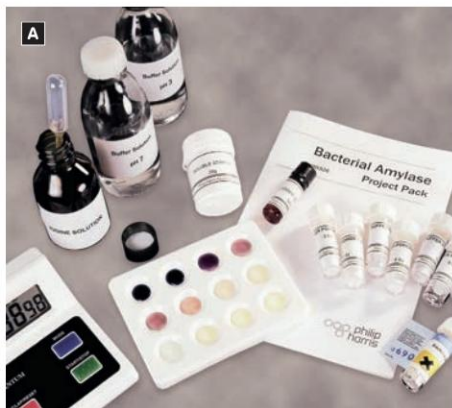
Substrate	Product	Source	Comments	each
2% Starch	Maltose	Aspergillus spp.	Contains reducing sugars	£10.95
2% Starch	Maltose, Dextrins	B. subtilis	Contains reducing sugars	£6.99
2% Starch	Maltose, Dextrins	B. subtilis	Contains reducing sugars	£25.95
2% Starch	Maltose, Dextrins	Aspergillus sp.	For use with B8A01594 to B8A01685	£11.95
20% Hydrogen peroxide	Water & Oxygen	Micrococcus lysodeikticus	Commercial Grade Liquid	£10.95
1% Carboxymethyl	Glucose	Aspergillus sp.		£48.95
2% Starch	Maltose, Dextrins	Malt	Substrate must be boiled to break down starch granules, contains c 20% reducing sugars	£12.95
5% Glucose	Fructose	Streptomyces murinus		£10.95
5% Sucrose	Glucose & Fructose	Yeast		£14.95
5% Sucrose	Glucose & Fructose	Yeast	For use with B8A01594 to B8A01685	£19.95
5% Lactose	Glucose & Galatose	Yeast		£13.95
Whole milk or glycerol triacetate	Acetic acid and Free fatty acids	Porcine pancreas		£18.95
Various*	Various*	Porcine pancreas	*Contains proteases, lipases, amylases	£45.95
Fruit pulp 2 - 4% pectin		Aspergillus spp.	Commercial grade liquid	£36.95
Exposed film, skimmed milk or other protein suspensions.	Peptides and AA's	Porcine stomach		£11.95
	Peptides and AA's			£15.95
	Amino Acids			£21.95
	Amino Acidsw	B.licheniformis	For use with B8A01594 to B8A01685	£16.95
Fresh milk	Caseinogen forms casein	Fungal Rhizomucor miehei	Casein binds with calcium to form caseinate causing milk to gel	£7.79
Fresh milk		Calf stomach		£13.95
Fresh milk		Calf stomach		£44.95
Protein solutions	Peptides and AA's	Porcine pancreas		£25.95
1 - 2% Urea	Ammonia and CO ₂	Jackbeans		£27.95
1 - 2% Urea	Ammonia and CO ₂	Jackbeans		£16.95

GLOSSARY**Practical Information**

- **pH** - recommended range for maximum activity
- **Temperature** - recommended range for maximum activity
- **Working Concentration** - dilution of the Enzyme (as supplied) to this level should give an acceptable reaction time

- **Substrate** - substance to be reacted with the Enzyme, and appropriate concentration
- **Product** - substances produced by breakdown of the substrate
- **Source** - origin of the Enzyme

Direct Delivery



Enzyme Project Packs

An excellent range of Enzyme kits ideal for project work by individuals or small groups of students. Each kit contains all reagents needed as well as instructions for use.

Can be used to teach key skills and concepts of scientific enquiry as directed in the National Curriculum.



A Bacterial Amylase Project Pack

This kit contains all the reagents (enzyme, starch, iodine and all buffers) necessary to carry out experiments into the effect of pH and temperature on Bacterial Amylase. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G90326

set **£43.95**

B Trypsin Project Pack

This kit contains all the reagents (enzyme, exposed film and buffers) necessary to carry out experiments into the effect of pH and temperature on Trypsin. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G90349

set **£43.95**

Protease Project Pack

This kit contains all the reagents (enzyme, exposed film and buffers) necessary to carry out experiments into the effect of pH and temperature on Protease SA. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G90351

set **£43.95**

C Lipase Project Pack

This kit contains all the reagents (enzyme, triacetin, sodium carbonate and indicator) necessary to carry out experiments into the effect of enzyme and sodium carbonate concentrations in the reaction time of Lipase. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G94381

set **£43.95**

D Urease Project Packs

This kit contains all the reagents (enzyme, urea, buffers and indicators) necessary to carry out experiments into the effect of enzyme and buffer concentrations on the reaction time of Urease active meal. The kit uses two different indicators so that students can compare the results. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G94393

set **£43.95**

Pepsin Project Pack

This kit contains all the reagents (enzyme, exposed film and buffers) necessary to carry out experiments into the effect of pH and temperature on Pepsin. Delivery time will be advised upon ordering.

Direct Delivery – up to 8 weeks

E8G90338

set **£43.95**



A Reagent Testing Strips

These test strips have been specifically designed for urine testing. In practice they have been adopted for educational use because of their simplicity and convenience. Just dip a strip into a test solution and wait a short while for the result.

Glucose Testing Strips

A qualitative determination of glucose in urine.

E8A02159 pack 50 **£12.95**

Glucose Testing Strips

A semi quantitative test for glucose in urine.

E8A02161 pack 50 **£7.79**

Protein Testing Strips

Protein (mainly albumen) in urine testing strips.

E8A02185 pack 50 **£10.95**

B Amino Acid Set

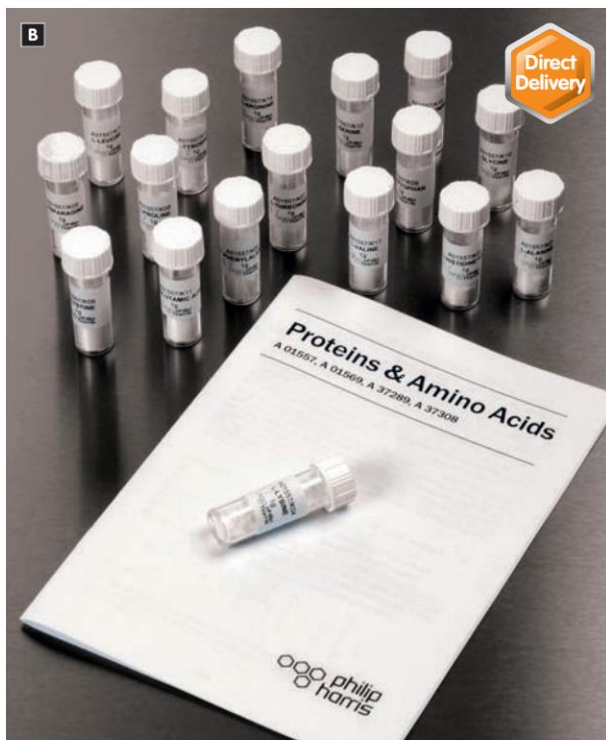
The amino acid structure of proteins can be determined by their hydrolysis and subsequent separation by chromatography. For this work, pure standards are essential and this set offers such standards. Supplied with teaching notes.

17 tubes of 1g each of the following:

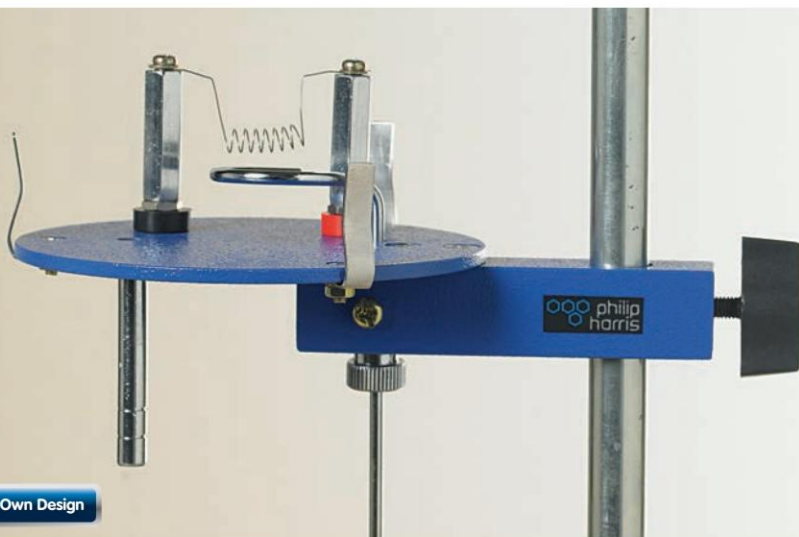
- L-Alanine
- L-Arginine
- L-Asparagine
- L-Cysteine
- L-Glutamic acid
- Glycine
- L-Histidine monohydrochloride
- L-Leucine
- L-Lysine monohydrochloride
- DL-Methionine
- DL-Phenylalanine
- L-Proline
- L-Serine
- L-Threonine
- L-Tryptophan
- L-Tyrosine
- L-Valine

Direct Delivery – up to 4 weeks

E8A01557 set **£82.95**



A



Our Own Design

B



Our Own Design

A Base Unit

Comprises a metal disc, 100mm diameter, with a boss for mounting on a 13mm retort rod. The unit forms the floor of the combustion chamber and has an inlet tube, 6mm diameter, for the oxygen supply, and a pair of pillars carrying the low voltage igniter coil. Also incorporated is a moveable crucible support enabling the crucible to be raised up to the igniter coil from outside the assembled apparatus. Supplied WITHOUT retort stand, crucible or spirit lamp.

E8R00546

each **£78.95**

B Food Calorimeter

Borosilicate water jacket, 205 x 100mm diameter, surrounding an integral combustion chamber, open at the base.

The combustion chamber is connected to a copper spiral heat transfer tube, which, when used, is connected to a filter pump to draw the products of combustion through the copper spiral. A wire stirrer passes through the cover, and a hole with a bored and split rubber stopper is provided to accommodate a thermometer. Please note this item does NOT include the Base Unit and is supplied WITHOUT a thermometer.

E8H24816

each **£89.95**



CROSS REFERENCE

Low Toxicity Thermometers - Partial Immersion see page 418

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www.findel-international.com



A Tooth Foam Model

This foam model comes in pieces to show the structure of a tooth. Complete with notes.

Size: 260 x 360mm.

E8R06016

each **£34.95**

B The Digestive System Model

Representation of the nose, mouth cavity and pharynx, oesophagus, the gastrointestinal tract, liver and gall bladder, pancreas and spleen. Duodenum, cecum and rectum are opened. The transverse colon is removable. Mounted on a board and numbered with key card.

E8R03297

each **£163.95**

C Effects of Diabetes

This model shows the effects of diabetes on eye, heart, kidney and foot. The organs can be rotated for a detailed examination. Mounted on stand.

Size: 165 x 120 x 360mm. Weight: 430g.

E8R02015

each **£107.95**

D Disclosing Tablets

For demonstrating the presence of plaque on teeth and gums. Stains plaque red. Colour easily removed by brushing teeth. Supplied in a pack of 20.

E8A24489

pack 20 **£5.99**

E Dental Care Model

This large scale, detailed model is held together with a bendable wire spring and is ideal for demonstrating the correct way to brush your teeth and gums. Includes a giant, soft bristle toothbrush.

E8F60303

each **£29.95**

F Plastic Dental Mirrors

Children can look into each other's mouths or their own using these disposable dental mirrors. The high quality mirror housed in a plastic handle makes an excellent tool for oral inspection.

E8R00542

pack 10 **£5.99**

G Dental Model 4x Life Size

This 4 times life-size representation of the right lower jaw (teeth 3 to 7) shows various diseases and treatment solutions. Shown on the model are the following: discolouration, caries, apical infection, dental tartar, periodontitis, and devital teeth (3 & 5). The following treatment solutions are shown on the model: veneer, bonding porcelain crown, root pin construction, full ceramic and gold inlay. All of the anatomical features of the jaw and teeth are also illustrated. Size: 170 x 100 x 50mm. Weight: 410g.

Direct Delivery – up to 4 weeks

E8R05598

each **£95.95**



A Obesity Suit

The obesity suit is a great educational tool to show the effects of additional weight on a human body. It simulates the "look" and "feel" of excess body fat allowing students to understand the effects of weight gain on the body.

The vest features an adjustable Velcro® back fastening, reinforced shoulder straps and various pockets to hold the extra weight. The bean bags are 1kg in weight. 100% cotton, machine washable.

Direct Delivery – up to 2 weeks

EBR06171 each **£227.95**

B Philip Harris Bean Bag

EBR06172 1kg each **£3.59**

C Platform Scale

Sturdy mechanical scale weighing up to 125kg. Colour may vary.

E8A51172 each **£13.95**

D Weighing Scales with Body Fat Monitor

The Tanita UM-076 is perfect for monitoring changes in your weight and body composition over time. Using the latest Innerscan technology you will see the true impact of your diet and fitness programme on your body.

Features:

- Easy to use
- Stylish design
- Four data storage memories
- Advanced dual frequency technology
- Measurements:
- Weight
- Body fat % (age 5–99 years)
- Healthy body fat indicator
- Total body water %
- Muscle mass in kg
- Basal metabolic rate
- Visceral fat indicator
- Guest mode
- Previous reading recall

E8R06020

each **£47.95**

E Electronic Flat Scales

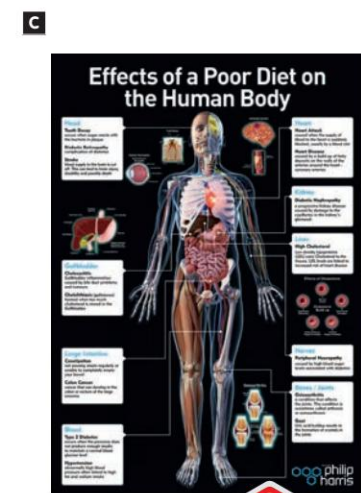
Advanced technology for enhanced comfort. The extra flat dimensions make stepping onto these scales easy and comfortable. Assistance is provided by the four specially constructed load cells of stainless steel. Other reasons to admire the scales include a high-quality glass surface and extra large LCD figures.

Specification:

- Capacity: 150kg
- Graduation (g): 100g
- Power supply: Battery
- Measure: W310 x D310 x H37mm
- Net weight: 2kg
- Functions: Auto-HOLD, Step-Off, kg/lbs/sts switch-over, Tap-on automatic switch-on, automatic switch-off

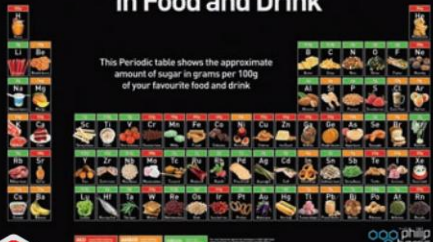
EBR06170

each **£46.95**



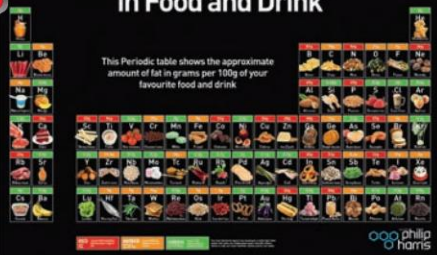
D

A Periodic Table of Sugar Content in Food and Drink



New

A Periodic Table of Fat Content in Food and Drink



E

Our Own Design

New

Direct Delivery

A Slimguide Skin Fold Calliper

A skin fold calliper is a device which measures the thickness of a fold of skin with its underlying layer of fat. By doing this at key locations it is possible to estimate the total percentage body fat of a person. Skin fold callipers have springs which exert a set pressure on the skin fold, generally 10g/mm², and an accurate scale which measures the thickness in millimetres. Instruction booklet included.

E8A24211

each £21.95

B Grip Dynamometer

This analogue Grip Dynamometer is designed for measuring the flexion of the wrist and provides an accurate reading of grip strength and estimating a general value for upper body strength. The dynamometer is a standard piece of equipment in most physiology testing labs and provides an easy and safe means of measuring muscular strength. It can be adjusted to fit a wide range of hand sizes and normative grip values are available from ages 10 to 70. Comes with instructions on the correct protocols to produce accurate results, measuring physical fitness, aptitude, psychological and physiological parameters.

E8L87740

each £181.95

A1 Information Posters

These are a series of brightly coloured and informative posters that will capture students' attention and provoke debate.

Size A1, dimensions 594mm x 841mm.

Direct Delivery – up to 2 weeks

C Effects of a Poor Diet Poster

E8R06025

each £17.95

D Periodic Table of Sugar Content Poster

E8R06023

each £17.95

E Periodic Table of Fat Content Poster

E8R06024

each £17.95

A



CURRICULUM LINKS

- Gas exchange system in humans – breathing, adaptations to function
- The impact of exercise, asthma and smoking

Direct Delivery

B



C



D



Economy Science

A Respiration Apparatus

For inhaled and exhaled air tests. Comprises two boiling tubes each with stopper and two lengths, one short and one long, of 5mm glass tubing, connected by PVC tubing and plastic T.

Direct Delivery – up to 10 days

E8H24889

each **£27.95**

B Simple Respirometer

For comparing rates of absorption or evolution of gases by small organisms, during respiration. The apparatus consists of two stoppered boiling tubes connected by three-way taps to either limb of a graduated manometer. One tube holds the organisms and has a syringe for altering the level of liquid in the manometer during setting up. The other tube acts as a control thermobarometer. CO₂ given off by the respiring organisms is absorbed by potassium hydroxide in the experimental chamber resulting in a change in the level of liquid in the manometer tube.

Complete with instructions and wire baskets for supporting organisms.

E8H24890

each **£41.95**

B Glass Manometer Tube

For construction of a simple respirometer. Mounted on a clear acrylic panel by a locking bar, allowing graph paper to be mounted behind the manometer. Dimensions: 140 x 70mm, height x width. Capillary bore: 2mm diameter.

E8A02410

each **£18.95**

C Human Lung Model

This model shows the larynx (2-parts which are removable) wind pipe with bronchial tree, heart (2-parts which are removable) subclavian artery and vein, Venacava aorta, Pulmonary artery, oesophagus, 2 lungs (the front halves are removable) and diaphragm. Mounted on a base. Includes English Key cards. Dimensions: 125 x 125 x 300mm.

E8R04621

each **£59.95**



Great Value

Pocket Spirometer Bundle
 This great value for money kit includes the Pocket Spirometer, Peak Flow Meter and spare mouthpieces for both, all for a great price.

E8R00414 kit **£198.95**




A Pocket Spirometer

This hand held spirometer measures lung capacity without the need for water. Its advantages over the conventional tank-type spirometer are its portability and ease of operation enabling it to be used for physiological experiments out in the field as well as indoors. Lung capacity is simply measured by breathing out through the mouthpiece and recording the readout on the dial. Range: 1000-7000 cm³. Supplied with 50 plastic mouthpieces.

E8A20631 each **£189.95**

Spare Mouthpieces for Pocket Spirometer

E8G64765 pack 50 **£16.95**

B Peak Flow Meter

Peak flow meters allow people to monitor their asthma; Peak Expiratory Flow (PEF) is a measurement of how fast someone can blow out. When you are well your PEF is higher, when the airways are narrow (as in asthma) PEF is lower.

E8L07109 each **£15.95**

Spare Peak Flow Meter Mouthpieces

E8R04186 pack **£10.95**

C Lung Volume Bag Kit

A kit comprising four lung bags, with holders and mouthpieces designed for investigations into lung capacity. The bag is made of durable plastic and is silk screened with graduations up to six litres. Useful for comparing lung volume with height, age etc. Instructions included.

E8A20667 kit **£47.95**

D Milton Disinfecting Fluid

Ideal for disinfecting mouthpieces for Pocket Spirometer and Peak Flow Meter. Safe to use, non-toxic, non-staining. 100% germ kill. 5 litres.

E8R06352 each **£12.95**

A



A Lung Demo Model in a Bell Jar

This simple model demonstrates the functioning of lungs for students. This depicts how the lungs are emptied and filled with air by the relaxation and contraction of the diaphragm muscle. Two balloons attached to a Y-tube simulate the lungs. The chest cavity is a bell jar with open top and stout rubber sheet that acts as the diaphragm. As the diaphragm is pulled downward, the atmospheric pressure is lowered inside the chamber, causing the lungs to expand and take in air. When the diaphragm is released, the lungs deflate.

EBR06015

each **£27.95**

B Clifton Spirometer

A wedge-type spirometer suitable for simple experiments on investigating tidal volumes and breathing rate, or for more advanced use in measuring respiratory rate, pulmonary ventilation, reserve volumes and vital capacity. Oxygen consumption can also be measured.

The tank is a one piece stainless steel pressing housed in a durable painted outer case. The float is constructed from lightweight plastic. The float is calibrated 0 to 7 x 0.5 litres and has a metal counterpoise. The pen arm corresponds to approximately 0.5 litres. The two corrugated breathing hoses 0.8m long are provided with two mouthpieces and a nose clip. A simple lever control enables the subject to be connected either to atmosphere or to the float for recording. A container for soda lime crystals is fitted that can be used to absorb carbon dioxide. Internal Diameter = 19mm, External Diameter = 21mm, External Dimensions - W720 x D320 x H239mm.

Direct Delivery - up to 4 weeks

EBL31860

each **£1019.95**

B



Soda Lime for Spirometers

Crystals suitable for use in spirometers. Please note that due to the nature of the material, fine particles may be produced during transport and storage. These must be removed before use.

Direct Delivery - up to 2 weeks

EBL12476

500g

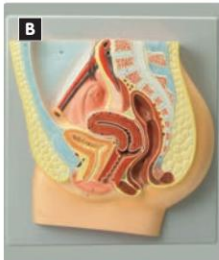
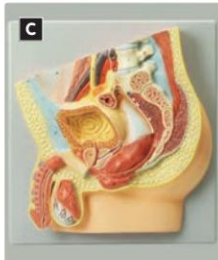
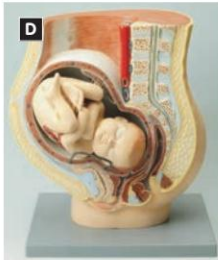
each **£20.95**



INVESTIGATIONS

The spirometer can be used for investigating tidal volumes, respiratory rate, pulmonary volumes and vital capacity. Oxygen consumption can also be measured which is useful in metabolic studies. Use a data logger to log the movement of the spirometer and determine breathing rate.

A

B

C

D

E


A Period of Gestation

Chronological series of the embryo development during the pregnancy, 8 different models in 15 parts. Mounted on base. Numbered with English Key Card.

E8R05980

each **£167.95**

B Human Female Reproductive System

Natural size, female genital organs with bladder and rectum fully exposed. Mounted on a base, numbered, includes English key cards. Size: L388 x W350 x H76mm. Weight: 1.4kg.

E8R04627

each **£41.95**

C Human Male Reproductive System

Natural size. Rectum, bladder with prostate and testicular ducts and external and genital organs are clearly shown. Mounted on a base, includes English key cards. Size: L381 x W342 x H88mm. Weight: 1.7kg.

E8R04628

each **£39.95**

D Human Foetus

Representation of a median section through the female pelvis in the 9th month of pregnancy with a removable foetus. An excellent model to study normal position of child birth. Mounted on a base. Includes numbered English key cards. Size: L420 x W230 x H420mm. Weight: 3.7kg.

E8R04629

each **£53.95**

E Condom Training Model

A low cost expanded polystyrene model of an erect human penis. For individual or group tuition in the correct use of condoms. Overall height: 145mm. Supplied in packs of 20 WITH/OUT condoms.

E8A24533

pack 20 **£47.95**

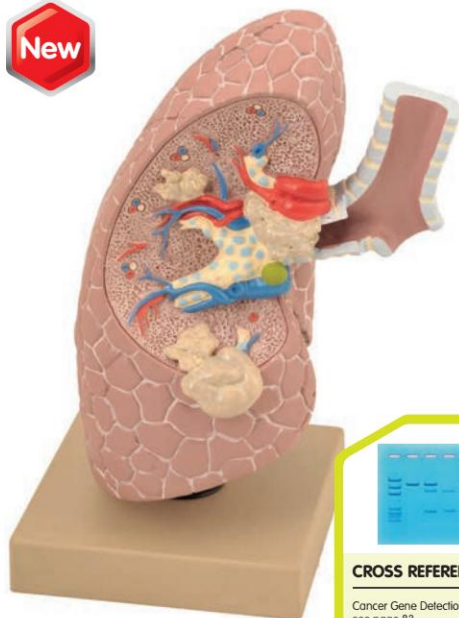
CURRICULUM LINKS

- Reproduction in humans
- Structure and function of reproductive organs as well as fertilisation and birth
- Reproduction in plants – structure, fertilisation and dispersal

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk

A



CROSS REFERENCE

Cancer Gene Detection
see page 83

C

A Lung Cancer Model

This life size lung model shows how cancer affects the lung. Mounted on base. Numbered with English Key Card.

E8R05979

each £79.95

B Smokey Sue

An excellent product to visually demonstrate the consequences of smoking. Pump the bulb in the neck to ignite the cigarette in her mouth and watch the tars collect in the test tube where her "lungs" would be. The test tube can be passed around the lesson to show the effect. Smokey Sue comes with a stand, 3 collection tubes and a high quality carrying case.

E8A24326

each £131.95

C Drug Awareness Guide

Colourful chart showing 8 categories of abused substances and various examples of each type. 66 substances and their paraphernalia are pictured and cross-referenced, together with their street names, uses and effects. Product is framed and supplied with an easel. Size: 610 x 914mm.

E8R05592

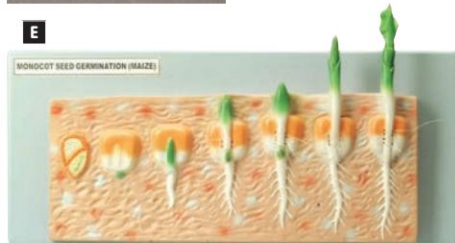
each £107.95



DRUG AWARENESS GUIDE

CATEGORY	DESCRIPTION	APPEARANCE	ROUTES OF ADMINISTRATION	MEDICAL USES	SHORT-TERM EFFECTS	LONG-TERM EFFECTS	SIGNS OF ABUSE
Depressants	Drugs that slow down the central nervous system, causing relaxation and drowsiness. Examples include alcohol, barbiturates, and benzodiazepines.		✓ Ingested ✓ Injected	Anesthetics, sedatives, muscle relaxants.	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination	• Chronic liver disease • Pancreatitis • Heart disease • Depression	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination
Narcotics	Drugs that relieve pain and induce sleep. Examples include heroin, morphine, and cocaine.		✓ Ingested ✓ Injected ✓ Inhaled ✓ Smoked	Pain relief, anesthesia.	• Euphoria • Relaxation • Sleepiness • Loss of consciousness	• Physical dependence • Tolerance • Withdrawal symptoms • Chronic pain	• Euphoria • Relaxation • Sleepiness • Loss of consciousness
Stimulants	Drugs that speed up the central nervous system, causing increased alertness and energy. Examples include amphetamines, cocaine, and caffeine.		✓ Ingested ✓ Injected ✓ Inhaled ✓ Smoked	• ADHD • Narcolepsy • Depression	• Increased alertness • Increased energy • Increased heart rate • Increased blood pressure	• Anxiety • Insomnia • Weight loss • Heart disease	• Anxiety • Insomnia • Weight loss • Heart disease
Alcohol	A depressant that slows down the central nervous system, causing relaxation and drowsiness.		✓ Ingested	Anesthetics, sedatives, muscle relaxants.	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination	• Chronic liver disease • Pancreatitis • Heart disease • Depression	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination
Heroin	A narcotic that relieves pain and induces sleep.		✓ Ingested ✓ Injected ✓ Inhaled ✓ Smoked	Pain relief, anesthesia.	• Euphoria • Relaxation • Sleepiness • Loss of consciousness	• Physical dependence • Tolerance • Withdrawal symptoms • Chronic pain	• Euphoria • Relaxation • Sleepiness • Loss of consciousness
Cocaine	A stimulant that speeds up the central nervous system, causing increased alertness and energy.		✓ Ingested ✓ Injected ✓ Inhaled ✓ Smoked	• ADHD • Narcolepsy • Depression	• Increased alertness • Increased energy • Increased heart rate • Increased blood pressure	• Anxiety • Insomnia • Weight loss • Heart disease	• Anxiety • Insomnia • Weight loss • Heart disease
Amphetamines	Stimulants that speed up the central nervous system, causing increased alertness and energy.		✓ Ingested ✓ Injected ✓ Inhaled ✓ Smoked	• ADHD • Narcolepsy • Depression	• Increased alertness • Increased energy • Increased heart rate • Increased blood pressure	• Anxiety • Insomnia • Weight loss • Heart disease	• Anxiety • Insomnia • Weight loss • Heart disease
Barbiturates	Depressants that slow down the central nervous system, causing relaxation and drowsiness.		✓ Ingested ✓ Injected	Anesthetics, sedatives, muscle relaxants.	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination	• Chronic liver disease • Pancreatitis • Heart disease • Depression	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination
Benzodiazepines	Depressants that slow down the central nervous system, causing relaxation and drowsiness.		✓ Ingested ✓ Injected	Anesthetics, sedatives, muscle relaxants.	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination	• Chronic liver disease • Pancreatitis • Heart disease • Depression	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination
Alcohol	A depressant that slows down the central nervous system, causing relaxation and drowsiness.		✓ Ingested	Anesthetics, sedatives, muscle relaxants.	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination	• Chronic liver disease • Pancreatitis • Heart disease • Depression	• Slurred speech • Impaired judgment • Drowsiness • Loss of coordination

HEALTH EDUCATION



A Plant Growth Kit

Growing plants in the classroom can be a slow and disappointing process. But success is far more likely with viable seeds grown in appropriate compost in a propagator. As well as plant pots and saucers to reduce over watering, the kit includes broad bean and sunflower seeds, and cress seeds to grow in plastic petri dishes.

Direct Delivery – up to 8 weeks

EBR00434

each £70.95

B Giant Flower Model

This enlarged model allows students to study the floral and reproductive structure of a dicot. Petals, sepals and stamens are detachable. One anther has been sectioned to reveal the pollen within. The stigma is shown with pollen grains attached, one of which has generated a pollen tube which is shown entering the cut away ovary. All important structures are number coded for identification. Dimensions: 430 x 360 x 250mm.

EBA23989

each £89.95

C Typical Flower Model

Shows all the detailed parts of a typical flower like calyx, corolla, Androecium stamens and ovule L.S. Mounted on a plastic base. This item is numbered with English Key Cards.

EBR04633

each £29.95

D Pollination and Fertilisation Model

The main model is a vertical section through the stigma, style and ovary, showing the growth of the pollen tubes to the ovules. Separate models show anther, anther dehiscing, and different types of ovary in transverse and longitudinal section. Base size: 500 x 330mm.

Direct Delivery – up to 4 weeks

EBR05596

each £191.95

E Monocot Seed Germination

Model showing the germination of a monocot plant (Maize) seeds. Mounted on a base.

EBR04632

each £35.95

F Clinostat

For demonstrations of heliotropism and geotropism. Germinating seedlings are pinned to the cork table which is rotated by an electric motor at four revolutions per hour. The motor is spindle mounted and may be clamped by a thumbscrew so that the plane of the table can be set at any angle between horizontal and vertical. An acrylic cover is provided for the cork table.

Base: 1150 x W100 x H175mm.
Diameter of cork disc: 100mm.

EBH24956

each £111.95

G Herb Grobox

A complete kit with all you need to grow a range of herbs from seeds in 100% peat free compost. Contains added fertiliser.

EBR05602

each £10.95

H Seeds Pack

30 assorted packets of seeds for growing your own fruit and vegetables.

EBR05603

pack £21.95

I Dicotyledon Root (Vicia fabia)

A section through a typical dicotyledon root in the region of the root hairs. One side shows a longitudinal section through phloem and the other through xylem together with adjacent tissues. Radius of section 170mm, thickness 60mm. Supplied with a key card.

Direct Delivery – up to 4 weeks

EBR05677

each £155.95

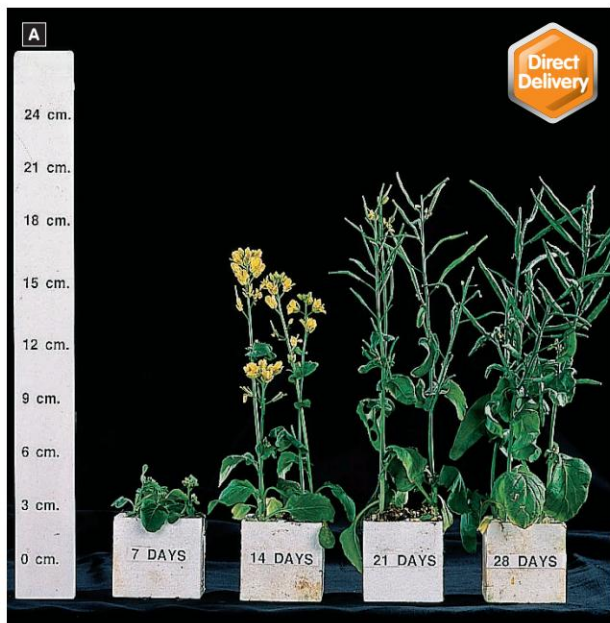
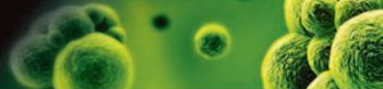
J Dicotyledon Leaf Model

A section through a typical leaf, showing epidermis, palisade and spongy mesophyll, vascular bundle and stomata. Supplied with key card. Size: 150 x 100 x 60mm.

Direct Delivery – up to 4 weeks

EBR05676

each £97.95



A Rapid Cycling Brassica Basic Kit

Rapid Cycling Brassica *rapa* ssp. *campestris* has been selectively bred to complete its life cycle quickly under conditions which can be easily set up in the laboratory. The genetics of *B. rapa* are not well studied as yet, so it is an attractive option for A-level research projects. The kit has been developed in collaboration with Science and Plants for Schools based at Homerton College, Cambridge.

- Seed to seed in 5 weeks
- Produces yellow flowers
- Pollinate with bee-sticks

The kit demonstrates:

- Life cycles
- Reproduction of plants
- Relationship between insects and plants

Rapid Cycling Brassicas need to be grown under 24 hour illumination from a bank of fluorescent lights. The kit does not contain a light bank but the notes include comprehensive instructions for the construction of one from readily available materials. It is supplied complete with photocopyable laminated worksheets.

Direct Delivery – up to 4 weeks

E8A19100 kit **£106.95**

Brassica Rapa Seeds

E8A19112 pack 200 **£27.95**

Growing Mix

E8A19124 2 litres **£10.95**

Polystyrene 4-Pots

Direct Delivery – up to 10 days

E8A19136 30 x 4 **£16.95**

NPK Slow-Release Fertiliser Pellets

Direct Delivery – up to 10 days

E8A19159 20g **£7.09**

B Laboratory Grade Seeds For Examination, Germinations and Experimentation

These seeds are for use in physiological and germination experiments. In the interests of safety it is our policy to supply natural 'untreated' seeds, however, occasionally this is not possible. Where treated seeds are supplied they are clearly labelled. The weights stated are correct at the time of packing but some loss may occur due to drying in storage.

Direct Delivery – up to 10 days

E8A18909 Maize 100g **£7.79**

E8A18958 Cress 100g **£7.79**

E8A18946 Sunflower 250g **£6.19**

E8A18879 Oat 500g **£5.39**

E8A18880 Barley 500g **£15.95**

E8A18892 Wheat 500g **£14.95**

C Plastic Jar 0.25L

E8R06072 pack 12 **£22.95**



CURRICULUM LINKS

- Respiration of living organisms, forms and processes



A Cauliflower Cloning Kit (Meristem Tissue Culture)

This kit provides the necessary media and instructions for propagating small cauliflower plantlets from cauliflower curd. This technique, known as Meristem culture, has been chosen as an introduction to plant culture because of its relative speed and simplicity.

No special facilities are required and provided the instructions are followed carefully, plantlets should be visible in 6-8 weeks. Once grown, the plantlets can be transplanted into seedling compost and 'grown on'. Additional supplies of growth medium are available to allow teachers to adopt the technique to meet their own needs. Suitable for 16+ or 'A' level students.

Contents:

- Sterile loops
- 10 peat discs
- 10 vials medium
- 2 x 100cm³ medium.

Sufficient for ten students/groups.

Direct Delivery – up to 4 weeks

E8H53543

kit **£71.95**

Meristem Culture Medium

For the regeneration of plants from callus culture.

Direct Delivery – up to 4 weeks

E8A23322

10 vials **£40.95**

E8A23334

2 x 100cm³ **£22.95**

B Carrot Cloning Kit

This kit demonstrates the production of callus tissue from a root explant, and the recovery of whole, cloned carrot plants from the callus.

The cells of the callus can be examined as well as stages on the development of the whole plant from the embryo. Callus tissue can be maintained indefinitely in culture and provides a useful starting point for project work.

Contents:

- 10 vials callus medium
- 2 x 100cm³ callus medium
- 10 vials regeneration medium
- 2 x 100cm³ regeneration medium.

Sufficient for up to thirty students/groups.

Direct Delivery – up to 4 weeks

E8H53531

kit **£102.95**

Plant Culture Set

The kit consists of a plant culture medium which contains all the elements required by the plant as well as a range of mixtures which are deficient in one element only. These media are provided in powder form and are simply added to water before use. A clear demonstration of deficiency diseases can be given by growing seedlings or cuttings in the various solutions, following the full experimental details which are supplied.

Direct Delivery – up to 4 weeks

E8A23528

set **£53.95**

Mineral Deficiency Sach's Water Culture Set

Eight tubes each containing sufficient material to prepare four litres of liquid medium. One tube each lacking: phosphorus, nitrogen, calcium, potassium, magnesium, iron, sulphur and the complete (normal) medium.

Direct Delivery – up to 4 weeks

E8A23565

8 tubes **£31.95**

Sach's Water Culture Medium Packs

Each pack contains six tubes each containing sufficient material to prepare four litres of liquid medium.

Direct Delivery – up to 4 weeks

E8A23577

Complete

6 tubes **£31.95**

E8A23590

Lacking Nitrogen

6 tubes **£28.95**

C Plant Hormones Set

The study of plant hormones provides a fascinating insight into the way plant growth and development is controlled. This set can be used to demonstrate the role of plant hormones and their use by man, thus experiments on breaking dormancy in seeds, rooting cuttings, killing weeds, preventing leaves from dropping, etc. are included. These experiments are not difficult to perform and many are suitable for GCSE students. Contents:

- Culture Medium (enough to make up 20 litres)
- Indol-3-yl acetic acid 1.5g
- Lanolin 100g
- Gibberellic acid 0.5g
- 2.4D Herbicide 10ml
- 0.1% IAA in lanolin paste 100g
- Coumarin 5g
- N.A.A. 10g
- 0.01% IAA in lanolin paste
- Thiourea 10g
- Ethrel C 10ml
- Tetrazolium chloride 1g
- Agar 10g
- Teaching notes

Direct Delivery – up to 4 weeks

E8A23097

set **£131.95**

Murashige and Skoog Medium

Without sucrose, IAA, Kinetin and Agar. Agar should be added of 10g/litre. Supplied as powder sufficient to make the specified quantities.

Direct Delivery – up to 4 weeks

E8A23504

1L **£10.95**

E8A23516

5L **£59.95**

D Murashige and Skoog Plant Salt Mixture + Minimum Organic

Base for plant tissue culture media.

Without plant hormones or agar, which should be added as follows:

To maintain callus add 5x10-8g/litre 2,4-D (weedkiller) and 6g/litre agar.

To maintain apical meristem, or for rooting shoot tips, add 0.3mg/litre IAA, 1mg/litre kinetin and 6g/litre of agar.

Direct Delivery – up to 4 weeks

E8A23486

1L **£13.95**

Plant Growth Substances

Direct Delivery – up to 2 weeks

Gibberellic acid

E8A23115

100mg **£10.95**

IAA Indol-3-yl-acetic acid

E8A23139

1g **£7.49**

E8A23140

5g **£25.95**

IAA 0.1% w/w in lanolin

E8A23152

100g **£15.95**

Kinetin (1mm dm³ = 0.215g/litre)

E8A23199

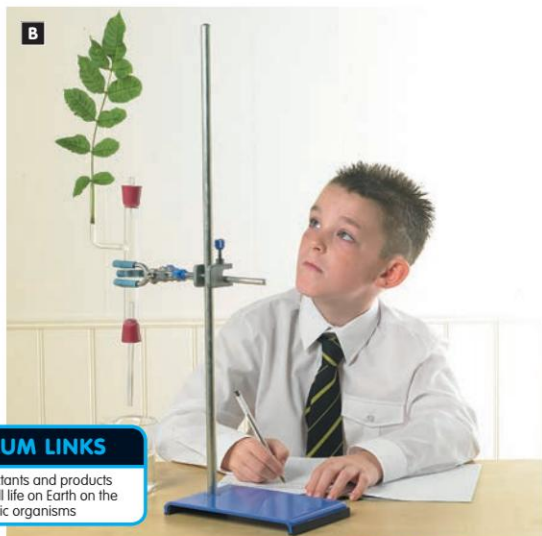
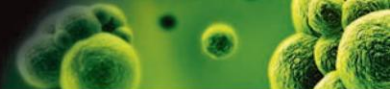
100cm³ **£9.19**

Abcissic acid (ABA)

E8A23206

50mg **£55.95**





CURRICULUM LINKS

- Photosynthesis – reactants and products
- The dependence of all life on Earth on the ability of photosynthetic organisms



Direct
Delivery

Our Own Design



Direct
Delivery

A Microburette

For measuring and sampling gas given off by aquatic plants e.g. Elodea. Comprises a bulb tube graduated 0 to 150mm into which the cut end of an Elodea shoot is inserted. Gas collected in the burette may be drawn into a syringe for analysis. Overall height 300mm. Complete with 5cm syringe and screw clip. Capillary bore 1mm.

E8A21439

each **£22.95**

B H Type Potometer

Suitable for individual student use, the cut shoot is attached to the side arm with tubing and the wide glass tube acts as the reservoir.

- Glass tube: 160 x 20mm length x depth, with side arm 8mm diameter.
- Capillary tube length: 140mm. Capillary bore 1mm.

E8A20916

each **£12.95**

C Photosynthesis Apparatus

For measuring and analysing gas given off by plants such as Elodea. Comprises two syringes connected to a collecting tube via a 3-way tap. This arrangement enables the gas to be drawn along the capillary tube by one syringe and collected into the second syringe for analysis. The apparatus is mounted on a backboard 240 x 100mm. Capillary bore 1mm.

Direct Delivery – up to 10 days

E8H24932

each **£34.95**

D Philip Harris Potometer

Ideal for laboratory and field use, this apparatus allows the student to measure transpiration with minimal risk of breakages. The apparatus has only one glass component (the capillary tube) and is mounted on a strong backing plate. It consists of a capillary tube with millimetre scale connected via a 3-way tap to a syringe. The cut shoot is connected to the third outlet. The apparatus can also be used to measure humidity by connecting a porous pot to the third outlet.

- Dimensions overall: 150 x 165 x 80mm, length x height x depth.
- Capillary tube: 120 x 1mm, length x bore.

Direct Delivery – up to 10 days

E8H24920

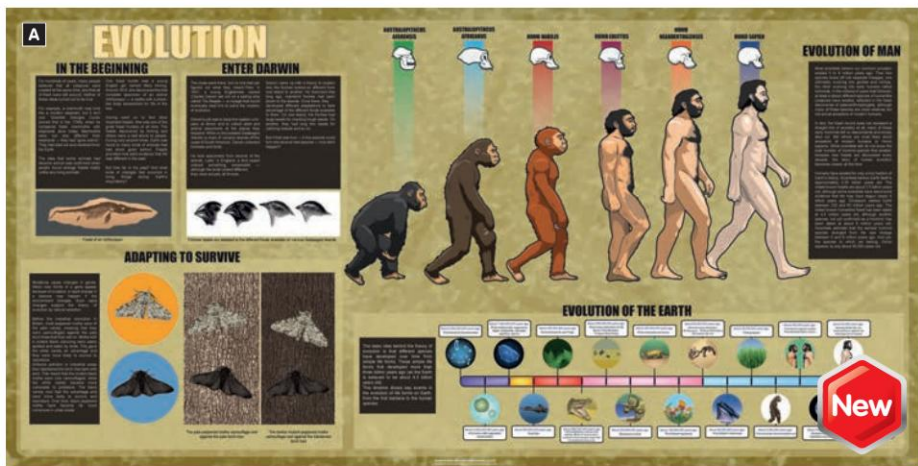
each **£41.95**

Porous Pot

100mm x 35mm o/d x 28mm i/d.

E8R05670

each **£5.99**



A Evolution Poster
Printed on durable, no tear plastic with a wipe clean surface. This evolution poster is packed with key facts, explanations and timescales on both the evolution of man and earth. Perfect for classroom use. Size: 1200 x 600mm.
E8R06019 each **£53.95**

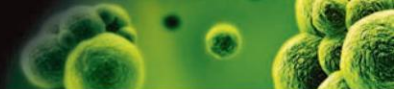
B People Packs
An ideal way to introduce students to the basic concepts of genetics. Each pupil has a 'person pack' consisting of attractive colour illustrations of a child's face showing a particular phenotype. Inside the pack are two copies each of the alleles for hair type, eye colour, earlobe type, normal or sickle cell anaemia. Pupils learn the concepts of dominant and recessive genes and will readily understand the necessity for meiosis. Co-dominance and the inheritance of genetic disease can also be introduced. This pack was designed by Dr. Rosy Reynolds, a practising teacher and has been used with pupils of 12 years and upwards.
Material for a total of 32 people packs is supplied.
Contents: People pack cards A & B, gene card (hair), gene card (eyes), gene card (ears) v gene card (Haemoglobin), Teacher's notes, people pack bags and worksheet master 1 & 2.
Direct Delivery – up to 2 weeks
E8A04418 pack **£75.95**

C Genetic Risk Game
What is the risk of genetic disease? Could it happen to you? The Genetic Risk Game was devised by Dr. Bernadette Modell of University College Hospital, London. Students produce 'families' using a dice tossed game and are introduced to the reality of statistical chance. They will find the concepts of inheritance easy to grasp through this original way of explaining Mendelian ratios. A comprehensive teacher's booklet and student worksheet master is included. Posters and leaflets on genetic diseases are also provided. The game is suitable for students age 14 upwards and there is sufficient material for a class of thirty.
Direct Delivery – up to 2 weeks
E8A04429 each **£65.95**

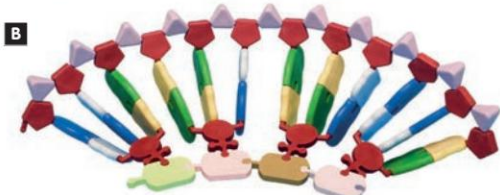
D Forensics Fingerprint Ink
This waterproof, quick drying ink is completely non-toxic and allows the uniqueness of fingerprints to be clearly demonstrated. Supplied in an 8mm tube.
E8A04406 each **£4.49**

E PTC Taste Papers
Paper strip dimensions 9mm x 50mm (25 strips each pack). This paper is bitter or tasteless depending on heredity of taster.
Each individual should take the taste test only once.
E8R06169 pack 100 **£3.29**





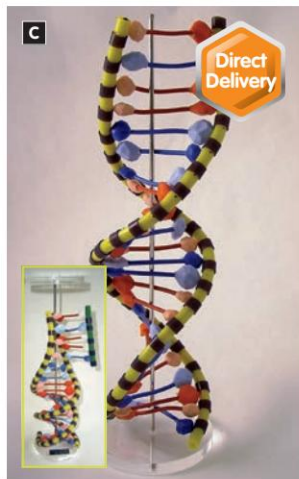
These Mini DNA Molecular Kits provide an easy to understand introduction to DNA structure. Comprises abstract shaped, colour coded parts to represent the nitrogenous bases, pentagonal sugar and pyramidal phosphate component parts present in the DNA double helix. Each component is designed so that it can only be attached in its correct position, e.g. Thymine will only pair Adenine. Can be constructed on the stand or without the separators provided. The model can also be uncoiled and “unzipped” to produce two strands. Scale $1\text{cm} = 2$ angstroms. Each kit contains all the necessary components, including stand, support rod and easy to follow instructions.



- A** 12-base Protein Synthesis Kit
E8R05595 each £13.95
- B** 24-base Protein Synthesis Kit
E8R05594 each £23.95
- C** Mini DNA 22 Layer Molecular Model Kit
E8H77213 each £45.95
- D** Mini DNA 11 Layer Molecular Model Kit
E8H77201 each £23.95

CURRICULUM LINKS

- Genes, DNA and heredity – differences between species
- Adaptations to changes in the environment
- Biodiversity



A Gene Expression Set

This high-quality, colourful model set provides an engaging way to teach high school and college students the structure of RNA and proteins, and the processes of transcription and translation. Students use the included DNA template to construct the corresponding mRNA. With this mRNA, the model pieces, and the genetic code in the instructions, students then assemble the protein sequence coded for by the mRNA. Magnets embedded in the pieces guide students in assembling the model in the correct molecular orientation. Model includes more detail than most teaching models covering the same subjects.

Step-by-step instructions are clearly written and easy to follow. The Teacher Manual and Answer Key Booklet contains a student worksheet master.

Direct Delivery – up to 4 weeks

EBR04933

kit **£503.95**

B Nucleic Acid Biobits

The Phospho-ribose and Phospho-deoxyribose units forming the backbone of RNA and DNA are represented by flexible PVC tubing which is reinforced with wire and punched to receive the purines and pyrimidines. These bases are moulded so that they fit easily into the backbone and can simply be joined by the hydrogen bonds.

The general kit contains enough components for the construction of transfer RNA and of DNA and RNA double helices.

The colour coding clearly shows the A-T, G-C and A-U base pairing, thus the principles of replication and transcription to RNA are easily demonstrated.

Supplied with booklet.

Direct Delivery – up to 2 weeks

EBA02501

kit **£269.95**

C Pre-Built DNA Helix 24 Layers

Manufactured by skilled staff at our own facility, this highly popular model shows approximately three complete turns of the helix made from the Nucleic Acid Biobits components. It clearly shows base pairing and transcription to a short strand of RNA. Mounted on stand and supplied with booklet. Can be dismantled.

Size: 300 x 85mm.

Direct Delivery – up to 2 weeks

EBA02574

kit **£86.95**

D Poppit Beads

Poppit beads are a highly useful laboratory modelling unit. They can be used to represent genetic code as well as whole chromosomes, or as amino acids, dipeptides, polypeptides and proteins in protein metabolism monosaccharide. Alternatively they can represent disaccharide and polysaccharide molecules in demonstrating carbohydrate metabolism. Mixed bag of 100g.

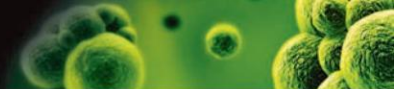
Direct Delivery – up to 10 days

E8L78050

pack **£29.95**

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A DNA Electrophoresis Class Kit

DNA Electrophoresis equipment for the whole class. Discover how easy Electrophoresis can be with this classroom set. Includes Fast 20 Minute Gel run, Easy Gel Casting, HexaGel Electrophoresis tank for 6 gels, DuoSource™ 150 Power Supply (75/150V), 6 Gel trays with GelCaps and and combs, 6 40mL minipipettes and tips.

Direct Delivery – up to 4 weeks

EBR03273

kit £658.95

B DNA Fingerprinting Using Restriction Enzymes

Teach your students about restriction enzyme digests in the context of Forensic Science. Your students will cut DNA with restriction enzymes and then compare the "Barcode" pattern of the crime scene DNA versus that of the suspects using DNA electrophoresis. For 6 lab groups, complete in 90 minutes.

Kit Includes DNA Samples, DNA Ladder, Dzyzymes (Eco RI and Hind III), Arogoose, Practice Gel Loading Solution, Loading Dye, Electrophoresis Buffer, Microtipped Transfer Pipettes and Gel Stain. You will also need micropipette to measure between 5 and 50µL or 5,10,15µL fixed volume mini pipettes, tips, a water bath, electrophoresis tanks and a power supply.

Direct Delivery – up to 4 weeks

EBR03278

kit £95.95

C Whose DNA Was Left Behind?

DNA obtained from a single hair left behind at a crime scene can be used to identify a criminal. In this experiment, students will compare simulated crime scene DNA with that of two suspects. For 10 lab groups, complete in 45 minutes. Kit includes ready-to-load dye sample, Arogoose Powder, Practice Gel Loading Solution, Electrophoresis Buffer, Microtipped Transfer Pipettes. You will also need electrophoresis tank and power supply.

Direct Delivery – up to 4 weeks

EBR03274

kit £53.95

D DNA Fingerprinting Made Simple

Students will solve a crime using real DNA. This ready-to-load kit means you can quickly teach DNA fingerprinting in your class and show your students how DNA evidence is used in modern Forensics. This experiment allows for varied results depending on the selection of DNA fingerprinting patterns.

For 12 lab groups, complete in 45 minutes.

Kit includes:

- Instructions
- Ready-to-load DNA samples
- Arogoose Powder
- Practice Gel Loading Solution
- Electrophoresis Buffer
- InstaStain Methylene Blue
- Methylene Blue Plus Liquid Stain
- Microtipped Transfer Pipettes

You will need:

- Electrophoresis Tank
- Power Supply
- Automatic Micro-Pipette with tips
- Balance
- Microwave or Hot Plate
- 65°C Water Bath
- White Light Visualisation System

Direct Delivery – up to 4 weeks

EBR03276

kit £191.95

E EdvoCycler

The EdvoCycler is a purpose built classroom PCR machine that is very easy to use. Students can amplify DNA from a variety of sources including their own DNA, with one of our many PCR kits. Comes pre-programmed, but is programmable with personal protocols as well.

- Holds 25 x 0.2mL tubes
- Heated Lid with magnetic latch
- Pre-programmed with all Edvotek PCR kit protocols
- Vivid LCD with live programme information
- Dimensions 410 x 220 x 180mm

Direct Delivery – up to 4 weeks

EBR03279

each £1685.95



F MegaCycler

As EdvoCycler, with space for 49 x 0.2mL tubes.

Direct Delivery – up to 4 weeks

EBR03280

each £2531.95

A DNA Paternity Testing Simulation

This experiment introduces students to the use of DNA fingerprinting in a simulated paternity determination. A child's DNA fingerprint is compared with his parents. The experiment does not contain human DNA.

Direct Delivery – up to 4 weeks

ED806001 each **£58.95**

B Transformation of E. coli Green

In this experiment, students will explore the biological process of bacterial transformation using *E. coli* and plasmid DNA. At the end of the activity, students will have experience observing and analyzing acquired traits (ampicillin resistance and fluorescence as exhibited by transformed bacterial cells).

Direct Delivery – up to 4 weeks

ED805995 each **£68.95**

C Human DNA Typing Using PCR

Your students use primers for a 300 base pair *Alu* insertion in chromosome 16 (P92) to determine their own genotype! They can then compare their class results with others around the world over the internet.

Direct Delivery – up to 4 weeks

ED805997 each **£153.95**

D Identification Genetically Modified Food

Some foods contain raw materials from genetically modified organisms (GMO). Examples include tofu, corn flakes and corn meal. In this experiment, your students will extract DNA from food or plant material and perform PCR to determine if any GM indicator genes are present. Amplified DNA is separated and sized by agarose gel electrophoresis. (Requires 1 to 3 day shipping)

Direct Delivery – up to 4 weeks

ED805998 each **£122.95**

E Simulation of HIV Detection

The HIV test detects HIV infection indirectly using an ELISA test against HIV antibodies in the blood. The test works by taking antibodies from the patient's blood and adding them to a microtiter plate coated with HIV antigen. If HIV antibodies are present in the blood, they will bind to the antigens on the plate. This binding is detected with an enzyme-linked secondary antibody that causes a color change upon addition of substrate. In this experiment, your students will perform an ELISA test by coating microtiter plate wells with simulated HIV antigen and then test simulated donor serum for anti-HIV antibodies.

Direct Delivery – up to 4 weeks

ED805996 each **£78.95**

F Blood Typing

ABO typing of blood left at the scene of a crime can help to narrow down a list of suspects. In this experiment, your students will use agglutination to identify the blood group of unknown blood samples as a step to identify a criminal.

Direct Delivery – up to 4 weeks

ED805999 each **£58.95**

G Cancer Gene Detection

Immortality through uncontrolled cell division is a characteristic of cancer cells. The p53 gene is a tumor suppressor gene which prevents this. Mutations in this gene are present in more than 50% of cancers. Testing people for mutations in their p53 gene can indicate an increased risk in developing cancer. These tests raise intriguing ethical questions for both the individual tested and the family of an individual who chooses to be tested. In this experiment, students determine a pedigree for a family suspected to be carriers of mutations in their p53 genes. A DNA test indicates their likelihood of developing cancer.

Direct Delivery – up to 4 weeks

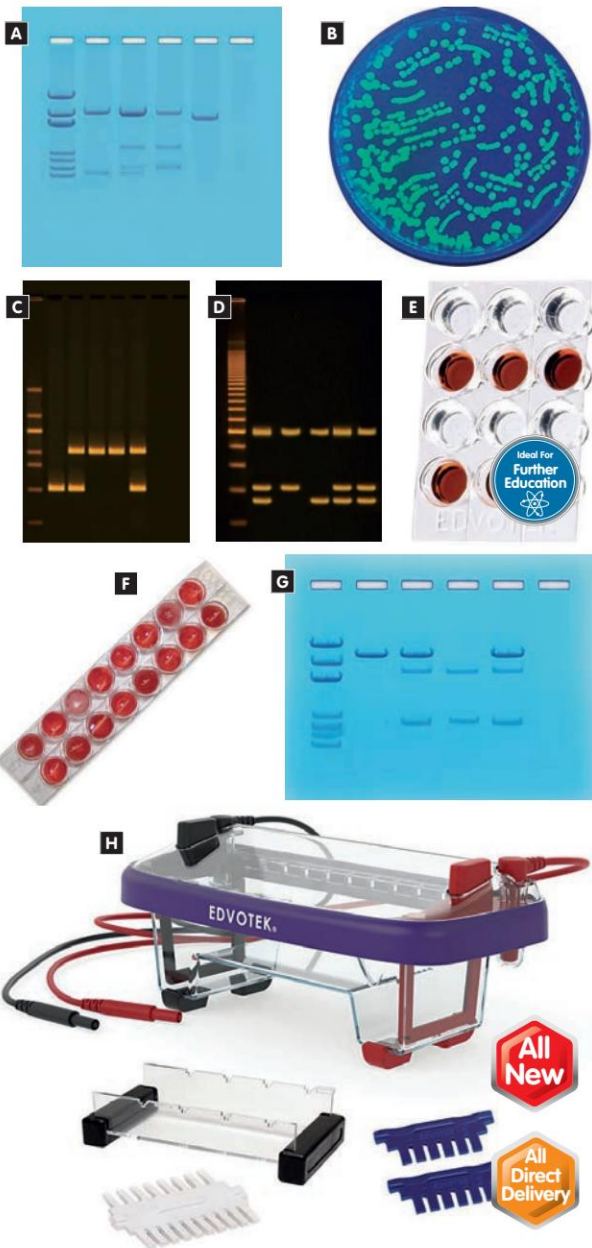
ED806000 each **£68.95**

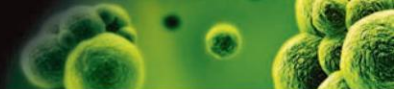
H Medium Electrophoresis

Run up to two groups of student samples at the same time. Choose either two 7 x 7 cm gel trays or one 7 x 14 cm gel tray. Gives excellent results in 30-40 minutes.

Direct Delivery – up to 4 weeks

ED806002 each **£159.95**





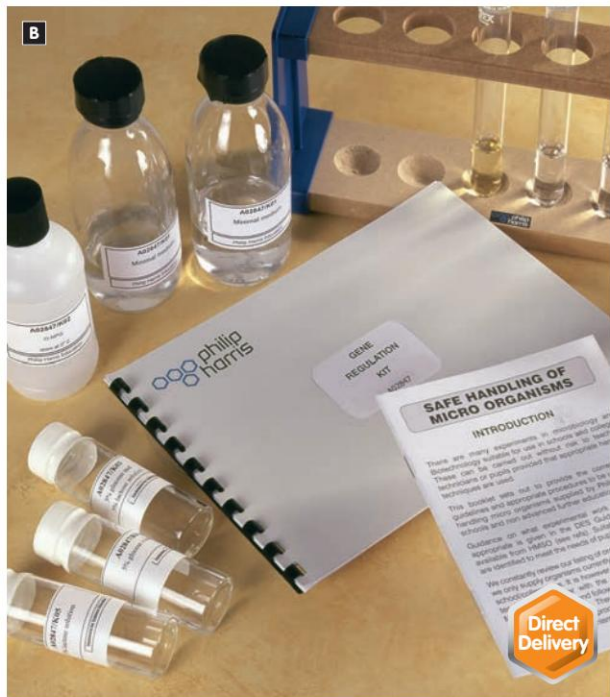
Practical Genetics

- Wide choice of organisms
- Examples for all levels

This page contains a variety of living organisms to give students hands on experience of genetics in action. GCSE students will enjoy sowing lettuce, tobacco or maize seeds and watching 3:1 ratios appear in the seed tray.

The application of genetics to food production is perhaps even more obvious in the study of corn cobs. For A-level students a large range of *Drosophila* mutants are available.

Micro-organisms such as *Saccharomyces* illustrate the spontaneous and deliberate production of mutants while the effects of gamma radiation are clearly shown in barley.



A Chromosome Staining Kit

This kit is designed to complement the book *Investigating Chromosomes* by Dr. A. F. Dyer of the Department of Botany, University of Edinburgh, by providing the necessary basic chemicals and equipment for ten students for ten pairs of students to make their own preparations from living organisms. The technique described is straightforward and has been evolved by Dr. Dyer to provide good results 'first-time'. Although onion seeds are provided with the kit, students will benefit from investigating other material.

Direct Delivery - up to 8 weeks

Chromosome Staining Kit

EBA02756

kit **£114.95**

Lactopropionic Orcein Stain

EBA02768

100ml **£13.95**

B Gene Regulation Kit

Not every cell in the body is alike. Genes may be switched 'on' or 'off' in different cells so that a muscle cell for instance is different from an epidermal cell. This kit examines the mechanism by which a particular gene in the bacterium *Escherichia coli*, coding for the enzyme β -galactosidase, is turned 'on' in the presence of lactose. This is the gene studied in the 1950's and 60's by Jacques Monod and François Jacob and led to the generally accepted Jacob-Monod model of gene regulation.

An ideal introduction to this complex subject at 'A' level. Contains enough material for twenty students.

Direct Delivery - up to 8 weeks

EBA02847

each **£81.95**

TO ORDER

Call

INT: +44 (0) 115 907 4001

ROI: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROI: 01 427 3118

A Simple Genetics Kit

For a class of 32 students. How are traits passed from one generation to the next? In this 45-day investigation, students observe 3 generations of plants as they attempt to unravel the mystery of paternity. As the activity progresses, students develop explanations, based on their own observations, for the inheritance of either 1 or 2 Mendelian genes.

E8A02896

kit £139.95

Mendel's Second Law Kit

Similar to our Monohybrid Genetics Kit, except students study inheritance of 2 genes segregating in the F2 generation. The experiment illustrates independent assortment, in addition to other principles of Mendelian genetics. Experiment time is 55 days.

Includes:

- Fast Plants® Seed (purple stem; from a strain that expresses the 2 recessive mutants Non-Purple Stem and Yellow-Green Leaf)
- F1 Seed (from a cross of the parent strains [an]/[an], ygr/[YGR])
- All Other Planting Materials
- Instructions

Direct Delivery – up to 10 days

E8A02926

kit £143.95

B Maize Ears Starchy V Waxy 3:1

F2 ear segregating 3 starchy to 1 waxy kernel. Used with the pollen material, they give the whole sequence of a simple monohybrid cross. The waxy kernels appear more shiny than the non-waxy, but the count can be confirmed by shaving off the tops and staining with iodine solution.

E8A04121

each £15.95

Tall V Dwarf 1:1

Seed from back cross of F1 to recessive parent segregating 1 tall to 1 dwarf on germination.

Direct Delivery – up to 10 days

E8A04054

pack 100 £21.95

Smooth V Sweet (Wrinkled) 3:1

F2 ear segregating 3 smooth to 1 wrinkled kernel.

Direct Delivery – up to 10 days

E8A04157

each £21.95

Smooth V Sweet (Wrinkled) 1:1

Ear from back cross of F1 to recessive parent segregating 1 smooth to 1 wrinkled seed.

Direct Delivery – up to 10 days

E8A04169

each £21.95

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**Practical
Information**

MAIZE FOR GENETICS STUDIES

All items are supplied with a leaflet giving a complete genotypic and phenotypic description.

A

24 cm.
21 cm.
18 cm.
15 cm.
12 cm.
9 cm.
6 cm.
3 cm.
0 cm.

Spares and Accessories

Direct Delivery

Spare seed for Rapid Cycling Brassica

Yellow Green RCBr Ant7 ygr:ygr
Direct Delivery – up to 10 days
E8A02902 pack 50 £18.95

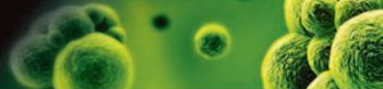
Rosette RCBr Ant7 ros:ros
Direct Delivery – up to 7 days
E8A02949 pack 100 £16.95

ROSETTE ROSETTE + G.A. WILD TYPE

B

Direct Delivery

Illustration Purposes Only



A Choice Chamber

A petri dish with 4 compartments and lid for easy viewing of woodlice and other small invertebrates. The compartments allow 4 different conditions to be observed.

E8R06054

pack 20 **£17.95**

B Prepared Food For Drosophila

As a considerable saving in time and labour, we offer our own ready to use standard food medium in tubes yeasted and plugged. The food tubes are prepared in quantity under sterile conditions and should remain in good condition for several weeks if stored in a refrigerator at 2-4°C on receipt. An anti-mould agent is included in the food formula.

Direct Delivery – up to 10 days

E8A03840

pack 10 **£19.95**

Ready Mix Dried Food For Drosophila

'Ready Mix' dried Drosophila food is a complete culture medium quickly made up by the addition of water. A mould inhibitor is incorporated and the need for autoclaving is eliminated. Each 100g pack contains sufficient for twenty tubes or five 150cm bottles together with a packet of dried active yeast.

Direct Delivery – up to 10 days

E8A03876

1kg

each **£17.95**

C Glass Bottle For Drosophila

Suitable for Drosophila melanogaster cultures. Capacity: 130cm³. Neck internal diameter: 30mm.

Direct Delivery – up to 10 days

E8H53567

pack 10 **£21.95**

Drosophila Value Packs

Direct Delivery – up to 10 days

E8A03530 Small Wild type and white eye each **£41.95**

E8A03542 Large Wild type and white eye each **£81.95**



Segregated Males And Virgin Females

Direct Delivery – up to 10 days

Phenotype	Virgin Females 10 tubes of 5	Males pack 50
Wild type	E8A03608 £77.95	E8A03619 £31.95
Vestigial wing	E8A03633 £55.95	E8A03645 £41.95
Ebony body	E8A03649 £61.95	E8A03670 £48.95
White eye	E8A03694 £59.95	E8A03700 £31.95

Ready Made Crosses

Direct Delivery – up to 10 days

E8A03773	Cross Wild type x Vestigial wing	£52.95
E8A03785	Cross Wild type x Ebony body	£53.95
E8A03797	Cross Vestigial wing x Ebony body	£52.95
	Cross Wild type male x White eye female	
E8A03803		£61.95
	Cross Wild type female x White eye male	
E8A03815		£52.95

D Fly Snooze Kit

For anaesthetising Drosophila, the flies remain immobilised for at least 50 minutes. Kit contains a 10ml vial of FlyNap and 12 anaesthetic wands. A separate anaesthetiser is not needed, it is safer to use than ether and easy to use. Kit contains 100 doses.

- Easy to use: dip the wand into the FlyNap solution and insert the FlyNap wand into the tube. Keep tube upright with wand in place for two minutes. Flies are then anaesthetised
- Less chance for dosage error
- Reusable wand controls dosage

Direct Delivery – up to 10 days

E8G83516

kit **£32.95**



A Locust, Preserved

Direct Delivery – up to 2 weeks

E8A19896

pack 10 £21.95

B Heart, Sheep or Pig, as available

Direct Delivery – up to 2 weeks

E8A20096

each £15.95

Eyes, Pig, Preserved

Direct Delivery – up to 2 weeks

E8A20084

pack 5 £23.95

Sheep Kidneys

Direct Delivery – up to 2 weeks

E8A20102

each £7.19

C Class: Amphibia

Direct Delivery – up to 2 weeks

E8A20011

each £10.95

D Class: Mammalia**Mus musculus (mouse), JEM Embalmed***

Direct Delivery – up to 2 weeks

E8A20035

each £13.95

Rattus Norvegicus (rat) JEM Embalmed*

Direct Delivery – up to 2 weeks

E8A20047

each £26.95

Rat, Plain Embalmed

Direct Delivery – up to 2 weeks

E8A20059

each £20.95

A**B****C****D****Practical Information****JEM EMBALMING PROCESS**

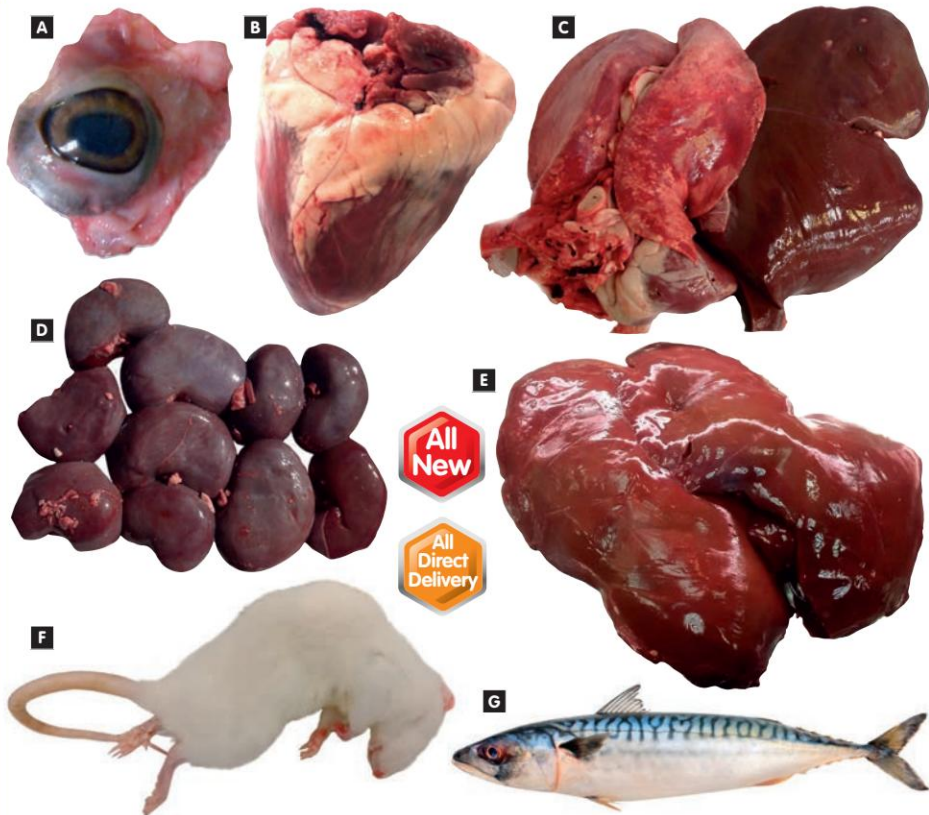
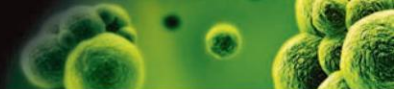
After fixation, specimens undergo a series of treatments to remove residual formaldehyde and replace it with an odourless preserving fluid. After dissection, specimens can be returned to their bags between classes and will not suffer the 'drying-up' effects normally experienced. The preservative is not an irritant to the skin and eyes, so the specimens are safer and more pleasant to handle.

* Please order JEM embalmed specimens for delivery just prior to use. If they are not used within 3-4 days of receipt, remove from bag and transfer to a sealed container containing Opresol preservative where they may be stored for up to three months.

PLAIN EMBALMING PROCESS

This process is a tried and tested method for embalming specimens. This formulation (including formaldehyde) for fixation and preservation, reduces formaldehyde vapours and incorporates agents to retain flexibility.





Dissection Specimens

New fresh specimens available for dissection. All specimens are processed, prepared and stored in the same way as food produced for human consumption. They are sealed in vacuum-packaging, packed in ice, packaged in polystyrene containers, sealed then labelled and dated. They are suitable to freeze.

The fresh parts are superior to the embalmed specimens as they are not affected by any chemical change. They do not have a strong odour and keep their original appearance without any distortion.

All lamb products are Halal certified. All products are sourced only from UK abattoirs with the highest standards of animal welfare in place.

The specimens should be ordered 10 working days before they are required to ensure they arrive on time.

Direct Delivery – up to 2 weeks

A Sheep Eyes

E8R06134

E8R06133

pack 5 **£13.95**

pack 25 **£57.95**

B Sheep Hearts

E8R06136

E8R06135

pack 5 **£15.95**

pack 30 **£69.95**

C Sheep Full Pluck

E8R06168

pack 2 **£34.95**

D Sheep Kidneys

E8R06137

pack 5 **£16.95**

E Sheep Liver

E8R06138

pack 2 **£20.95**

F Whole Rats

E8R06140

pack 10 **£37.95**

G Whole Mackerel

E8R06139

pack 5 **£37.95**

A Disposable Forceps

Blunt-end forceps of glass-filled nylon, serrated at tips with finger-grips along the shaft. Ideally suited to microbiology work where they may be destroyed after use. Length: 15mm (Colour may vary).

E8R05589pack 10 **£1.08****E8R00189**pack 100 **£9.95****B Pointed End Forceps**

Stainless steel.

	Length	each
E8R00172	110mm	£1.32
E8R00173	130mm	£1.32

C Blunt End Forceps

Stainless steel.

	Length	each
E8R00174	110mm	£1.44
E8R00175	130mm	£1.44

D Extra Long Forceps

Stainless steel. Length: 300mm.

E8R00176 each **£8.49****E Scalpels**

High-quality steel. Handle length: 113mm.

	Blade Length	each
E8R00177	38mm	£2.59
E8R00178	45mm	£2.59
E8R00179	50mm	£2.59

F Nickel Scalpel Handles

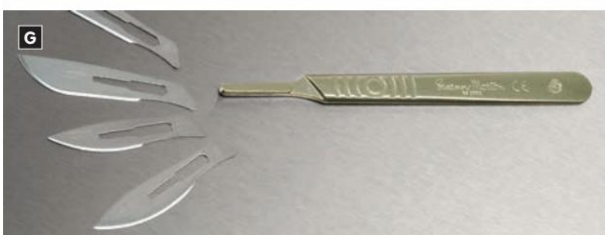
Strong nickel-alloy handles slotted to accept all blades from Item G.

	Handle No.	Length	each
E8R00180	3	95mm	£2.99
E8R00181	4	100mm	£2.99

G Scalpel Blades

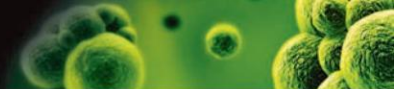
Surgical-quality steel blades for use with the handles above. Supplied in metal foil packs of five.

	Blade No.	Handle No.	pack 5
E8R00182	10	3	£0.60
E8R00183	10A	3	£0.60
E8R00184	11	3	£0.60
E8R00185	21	4	£0.60
E8R00186	22	4	£0.60
E8R00187	23	4	£0.60
E8R00188	24	4	£0.60



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QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



A



B



A Dissecting Scissors, Fine Point

Stainless steel, open shanks.

E8R00192 110mm pair **£1.89**

E8R00193 130mm pair **£1.68**

B Dissecting Scissors, Blunt Ends

Stainless steel, closed shanks. Overall length: 125mm.

E8R00194 pair **£2.59**

C Needle, Hardwood Handle

Needle length: 33mm. Mounted in 100mm hardwood handle.

E8R00195 pack 10 **£3.99**

D Needle, Steel Handle

Straight, stainless steel throughout. Needle length: 34mm. Handle length: 95mm.

E8R00196 each **£1.38**

E Seekers, Hardwood Handle

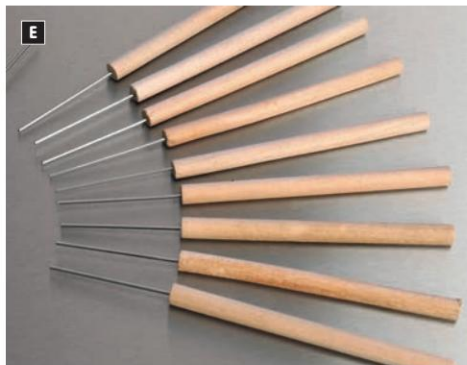
Blunt-end straight steel needle mounted in hardwood handle. Needle length: 40mm. Handle length: 80mm.

E8R00445 pack 10 **£3.79**

F Scalpel, Disposable

Plastic handle, steel blade. Supplied in sterile packs of ten. Blade No 11. Overall length: 140mm.

E8R00191 pack 10 **£4.19**



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RANGE
ONLINE AT**

www.findel-international.com



A Large Dissecting Pan with Pad and Cover

Plastic pans won't rust and the reusable pads are made from 'high grip' materials, so there is no need to melt wax. Large pans are perfect for larger specimens such as foetal pig, bull frog and star fish. Dimensions: 320 x 230mm.

E8R03285

pack 15 **£249.95**

B Large Dissection Pads

Reusable dissecting pads made from 'high grip' materials which eliminates the need for use of wax. Can also be used as a replacement pad for the Dissecting Pan. Dimensions: 320 x 230mm.

E8R03286

each **£13.95**

E8R03287

pack 5 **£63.95**

C Dissecting Tray

Made from Aluminium. Dimensions: L356 x W305 x H26mm.

E8R05566

each **£28.95**

E8R05567

pack 10 **£287.95**

D Dissecting Set

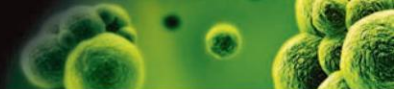
- 2 x No.3 scalpel handles
- 5 x Scalpel blades No.10, 5 x Scalpel blades No.10A
- 2 x Dissecting needles, straight, stainless steel in plain wooden handles
- 2 x Seekers, bent, stainless steel in plain wooden handle
- 1 x Forceps, sharp points, stainless steel, 130mm length
- 1 x Forceps, blunt points, stainless steel, 130mm length
- 1 x Scissors, open shanked, straight points, stainless steel, 150mm length
- 10 x Dissecting spikes
- Complete in canvas roller case

E8R00197

Black/Yellow

set **£27.95**





CURRICULUM LINKS

- Organisms in an ecosystem, including food webs and insect crops
- The importance of plant reproduction and how organisms affect and are affected by their environment



A Antaquaarium

The Antaquaarium is both a stylish, living, desktop conversation piece and a fascinating project for the young and curious. The elegantly-curved, clear plastic tank contains a specially-formulated gel that will provide food, moisture and a home for a small colony of ants. Magnifying lenses are included for closer inspection, although the inhabitants will need to be collected from the wild.

EBR05353 each **£18.95**

B Intermag Magnifying Pots

Medium sized magnifying pots, optical quality, low cost acrylic lens. On its own, the large 70mm lens makes an ideal specimen viewer, 3.5X magnification. The clip-in base allows 2 to be attached together to achieve clear "zoom" magnification.

EBR05384 pack 6 **£19.95**

C Tullgren Funnel

For extracting small organisms from soil samples. The upper surface of the soil is dried by the heat of a lamp above causing animals to move downwards until they drop through the lower mesh into a collecting dish.

Supplied with coarse and fine meshes, glass collecting dish, lamp and 1.5m 3-core cable.

For use on 230-250V a.c. supplies.

EBR00444 each **£71.95**

D Economy Pooter, Plastic

A durable plastic container with a screw cap, with safety filter.

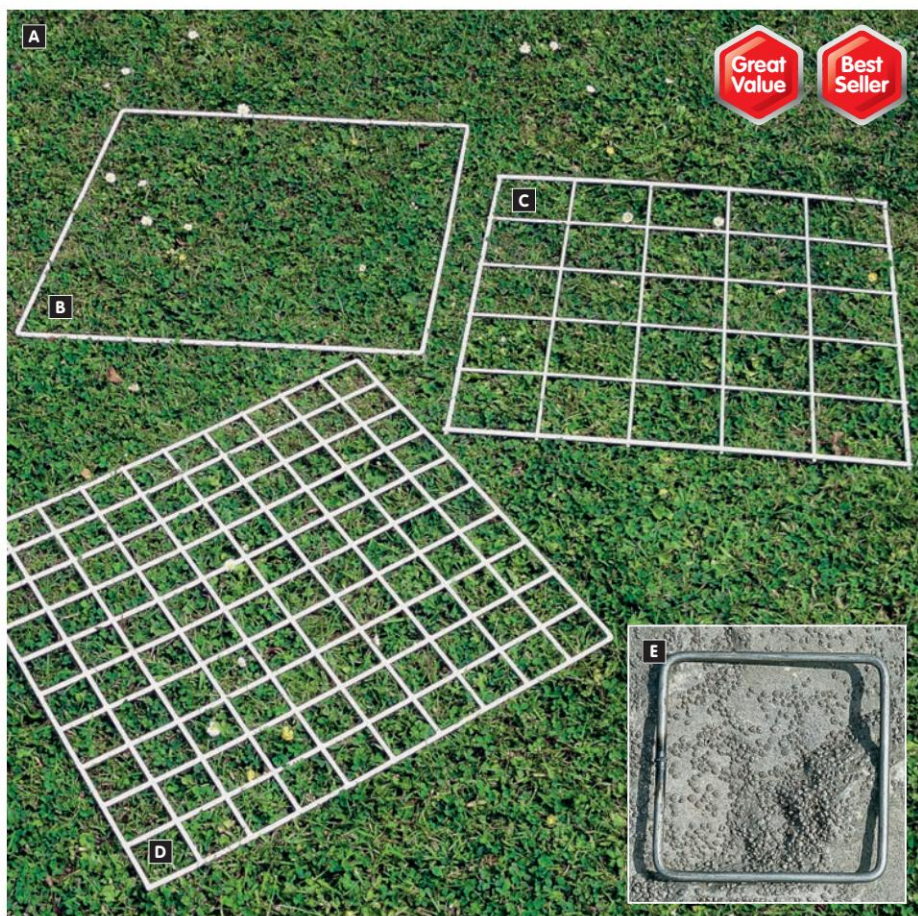
EBA24995 each **£2.49**

E Pooter

For collecting flies, spiders, and other small arthropods. A glass specimen tube, (75 x 25mm), with inlet and outlet tubes via a rubber stopper. Collecting tube has flared end and mouthpiece has a flexible connection.

A gauze filter confines collected specimens to the tube.

EBA25008 each **£12.95**



A Quadrat Bundle

Five x Frame Quadrats (Item B),
Five x Grid Quadrats 100 sq. (Item D)
and Five x Grid Quadrats 25 sq. (Item C).

E8R01735

pack **£185.95**

B Frame Quadrat

Heavy gauge steel wire with a tough protective plastic coating, 500 x 500mm.

E8A24958

each **£14.95**

E8R01920

pack 5 **£52.95**

C Grid Quadrat, 25 squares

Heavy gauge steel wire with a tough protective plastic coating, 500 x 500mm.

E8H47968

each **£21.95**

E8R01922

pack 5 **£92.95**

D Grid Quadrat, 100 squares

Heavy gauge steel wire with a tough protective plastic coating,
500 x 500mm, sub-divided into grid squares.

E8A24969

each **£18.95**

E8R01921

pack 5 **£92.95**

E Quadrat, Iron Wire

Square, constructed of 5mm gauge wire, for taking population surveys on flat terrain.
Side length: 100mm.

E8A24867

each **£1.56**

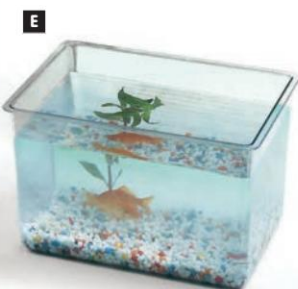
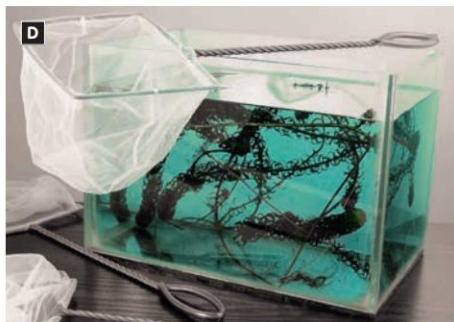
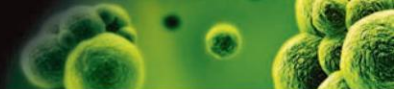
F Measuring Tape 20m

Fiberglass with PVC covering. Non-conducting, waterproof, washable, and water-resistant. The outer case is made of zinc-coated steel sheet, covered with vinyl and fitted with a flush winding-handle. Length 20 metre.

E8R06022

each **£10.95**





A Environmental Investigations Kit

A well-chosen selection of nets, containers and viewers for any outdoor exploration. Kit includes:

- White trays
- Nets
- Pipettes
- Hand lenses
- Petri dishes
- Pond dippers
- Sample jars
- Plastic forceps
- Plastic bags
- Bug pots

EBR06017

kit **£145.95**

B Pond Nets

For both pond and aquarium use. Strong gusseting to avoid tearing. High quality and very durable. Net measures 120 x 100mm, 450mm long.

EBR05372

pack 5 **£17.95**

C Bottom Net

Ideal for collecting material and animals from the bottom of streams and ponds. Plastic guard prevents the edge of the net from tearing when in use.

Handle length including head: 1m. Net opening: 106 x 300mm approx.

E8G87765

each **£5.59**

D Aquarium Net

Vinyl covered handle with 20 gauge, nylon mesh net. Net measures 155 x 125 x 140mm depth.

E8G65409

each **£2.29**

E Aquarium

Transparent one-piece moulded plastic aquarium. Approximate capacity 12 litres. Dimensions: 305 x 203 x 203mm.

E8A50167

each **£10.95**

**A The Econet**

A very economical, lightweight water net designed for younger children to use in ponds and streams. The total length of the durable aluminium frame with head is 1m and 25mm wide and also features a softer grip handle. The net bag is easily removed for washing or replacement.

E8R04580each **£43.95****B Butterfly Net**

The frame has a moulded handle with elasticated hook for attachment to belt or rucksack. The bag is fitted to the frame with an industrial nylon collar using Velcro®. Dimensions: 510mm long, net measures 270mm wide.

E8R04581each **£57.95****C Ultralight Sweep Net**

The Ultralight Sweep Net is extremely lightweight and easy to use by all ages. The black, plastic coated, light alloy frame has a moulded handle with elasticated hook for attachment to belt or rucksack. The bag is white washable nylon shaped to collect invertebrates at the foot end for easy searching with a lens or pooter. The bag is fitted to the frame with an industrial nylon collar using Velcro® so it can easily be removed for washing or replacement with a butterfly bag. Dimensions: 510mm long, net measures 270mm wide.

E8R04582each **£47.95****D Lightweight Pond Net**

The Lightweight Pond Net is 250mm wide and made from 1mm woven mesh as used in professional nets. The net head screws on to a telescopic handle that extends from 84 to 135cm making it ideal for use across a wide age range. The complete net and frame is light and easy to carry and the handle has soft foam grips.

E8R04583each **£43.95**



A Standard Soil 80 Test Kit

Sufficient reagents for 80 separate tests.

E8R06067

kit **£21.95**

B Sieve, Polythene

A larger, 350mm diameter and 110mm depth sieve with a 10mm mesh, ideal for separating larger particles, for example stones and pebbles from soil.

E8A63952

each **£4.79**

C Stainless Steel Sieves

Set of 3 nesting aluminium sieves with perforated stainless steel sieve elements, lid and bottom receiver. For fractionation of soils or sediments.

Dimensions of each sieve 60 x 155mm (overall height: 180mm). Mesh holes: 2.0mm, 1.0mm and 0.5mm diameter.

E8R01778

set 3 **£59.95**

D Plant Pots

Tough plastic plant pots with holes in base for aeration and drainage.

E8A63575 75mm

pack 10 **£2.99**

Direct Delivery – up to 10 days

E8A63587 90mm

pack 10 **£4.89**

E Plastic Sieve

This plastic sieve is good for both separating soils and for pond dipping.

E8A81462

each **£3.79**

F Combination Soil Meter

Combination instrument which measures pH, light and moisture. Simply insert the 2 bi-metal tipped probes into the soil to root level, switch to the correct setting and the reading is displayed on the scale. No batteries are required, the instrument has a virtually unlimited life. Supplied with instructions.

Ranges:

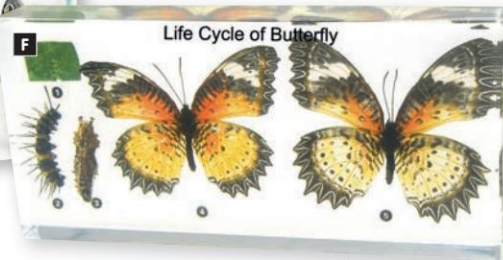
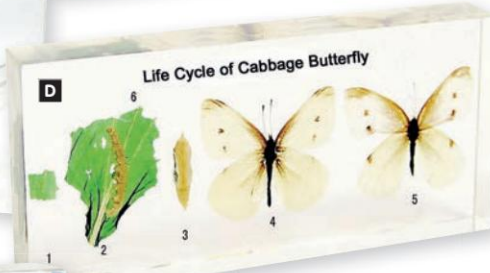
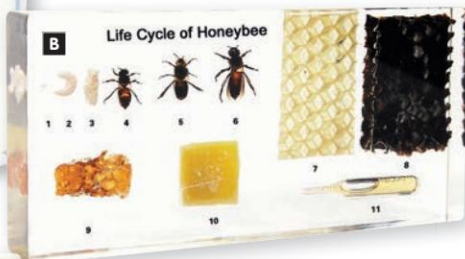
Light: 0 to 2000

Moisture: 1 to 10

pH: 3.5 to 8

E8H71430

each **£18.95**



Includes information cards

A Life Cycle of Grasshopper

See the full life cycle of a Grasshopper in this 9 stage development specimen. The real life grasshoppers are encased in break proof acrylic. Dimensions: 170 x 25 x 80mm.

E8R04584

each £38.95

B Life Cycle of Honey Bee

Shows the full life cycle of a Honey Bee, from the egg right through to the full sized bee, including honey, pollen and beeswax. Each stage is clearly displayed and encased in break proof acrylic. Dimensions: 170 x 25 x 80mm. Includes information cards.

E8R04585

each £38.95

C Life Cycle of Dragonfly

Clear acrylic block that allows students to view all of the stages of a dragonfly life cycle in detail front and back up close. This is a great tool for teaching about life cycles. Made of durable, acrylic that will not break if dropped.

Dimensions: 170 x 25 x 80mm. Includes information cards.

E8R04590

each £38.95

D Life Cycle of Cabbage Butterfly

The butterfly life cycle acrylic block is the perfect tool for teaching pupils about the life cycle of the butterfly. From egg to caterpillar and then to chrysalis and finally to an adult butterfly, see all of the details up close. The block is made of plastic so it will not break even if it is accidentally dropped.

Dimensions: 165 x 24 x 80mm. Includes information cards.

E8R04591

each £31.95

E Frog Development

With this educational piece, you can see first hand all the stages in the life of a frog. The block features real-life samples of an egg, tadpole, metamorphosis-stage frog and adult frog. All of this is nicely presented on an acrylic block. A fantastic addition to any science classroom. The durable acrylic block will not break even if it is accidentally dropped.

Dimensions: 140 x 64 x 24mm. Includes information cards.

E8R04592

each £38.95

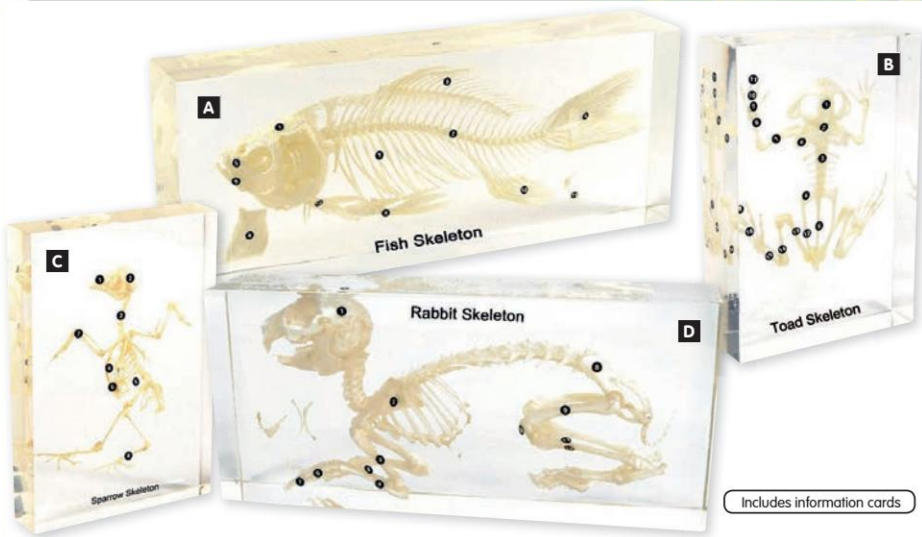
F Life Cycle of Butterfly

The beautiful Leopard Lacewing butterfly life cycle in an acrylic block is the perfect tool for teaching students about the life cycle of the butterfly. From egg to caterpillar and then to chrysalis and finally to an adult butterfly, see all of the details up close. The block is made of plastic so it will not break even if it is accidentally dropped.

Dimensions: 165 x 24 x 80mm. Includes information cards.

E8R04593

each £36.95



A Fish Skeleton

Shows a real fish skeleton encased in break proof acrylic. Size: 230 x 65 x 140mm. Includes information cards.

E8R04587

each **£65.95**

B Toad Skeleton

This real toad skeleton has been embedded in plastic for observation and study. Durable, clear acrylic allows close up viewing from all angles. Key features have been labelled and identified on an information card. Block measures 135 x 40 x 90mm. Acrylic block will not break even if it is accidentally dropped. Due to nature of the product it may differ slightly from the image shown. Includes information cards.

E8R05593

each **£50.95**

C Sparrow Skeleton

This is a real sparrow skeleton embedded in plastic for observation and study. Durable, clear acrylic allows close up viewing from all angles. Key features have been labelled and are identified on an information card. Block measures 135 x 24 x 90mm and will not break if accidentally dropped. Due to the nature of the product it may differ slightly from the image shown. Includes information cards.

E8R04588

each **£47.95**

D Rabbit Skeleton

This real rabbit skeleton has been embedded in plastic for observation and study. Durable, clear acrylic allows close up viewing from all angles. Key features have been labelled and identified on an information card. Block measures 230 x 65 x 140mm and weighs nearly 3 kilos. Acrylic block will not break even if it is accidentally dropped. Includes information cards.

E8R04589

each **£153.95**

Model Animal Skulls

These robust and accurate casts of top quality skulls are an ideal replacement for fragile skeletal material for teaching purposes.

Direct Delivery – up to 4 weeks

E E8A22330

Sheep

each **£147.95**

F E8A22317

Dog

each **£107.95**

**A Mini Beasts Name Trail**

This name trail guides users through a simple key to help them to identify the plants and animals that they find. Text on the reverse side of the charts provides further information. Splash proof and wipe clean for outdoor use. They are small enough to take into the field as the charts fold to B5 size (approx. 240 x 180mm).

EBA15854 each **£5.09**
EBR01702 pack 10 **£39.95**

B Fresh Water Invertebrates Name Trail

This name trail guides users through a simple key to help them to identify the plants and animals that they find. Text on the reverse side of the charts provides further information. Splash proof and wipe clean for outdoor use. They are small enough to take into the field as the charts fold to B5 size (approx. 240 x 180mm).

EBA15866 each **£5.09**
EBR01703 pack 10 **£39.95**

C The Rocky Shore

EBR00457 each **£5.09**
EBR01710 pack 10 **£39.95**

D The Tree

EBR00479 each **£5.39**
EBR01711 pack 10 **£43.95**

E Key To Plants Common To Sand Dunes

EBF56038 each **£5.09**
EBR01704 pack 10 **£39.95**

F Key To Woodland Plants

EBF56051 each **£5.09**
EBR01705 pack 10 **£39.95**

G Describing Flower Chart

EBF56762 each **£5.09**
EBR01706 pack 10 **£39.95**

H Playing Field Plants

EBR00456 each **£5.09**
EBR01709 pack 10 **£39.95**



Practical Information

Direct Delivery

PROTISTISTS CULTURING TIPS – These notes are to enable cultures to be maintained for a few weeks after receipt. Long term culturing is very time consuming and we recommend that cultures are purchased only shortly before they are required. Protists survive best in liquid media and should be sub-cultured before the culture becomes crowded. Cultures should be maintained at 20°C, or slightly cooler. Photosynthetic organisms require light, but others should be kept in the dark to prevent algal growth.

ALGAE – (Chlorophyta) Chlorella medium is suitable for most algae. Glass vessels such as 250ml conical flasks are ideal, and should be half filled and plugged with a foam bung to prevent dust contamination. **Algae require natural light, but should be kept out of direct sunlight.** A north-facing window ledge is ideal.

EUGLENA – (Euglenozoa) Euglena can be kept in boiled pond water with a few grains of boiled wheat or rice. **These protists require 18 hours of light daily.**

AMOEBA – (Rhizopoda) Culture amoeba in petri dishes half filled with glass-distilled water, and add 2–3 grains of boiled wheat or rice.

CILIATES AND FLAGELLATES – (Ciliophora) These protists are best cultured in a conical flask, half filled with boiled pond water or “instant pond water” and plugged with a foam bung to prevent dust contamination. Add a few grains of boiled wheat or rice. For a denser culture, add a little dried yeast.

CULTURE MEDIA KEY

The following media are those with which the organisms are supplied. The cultures may grow on other media (e.g. Norris' Nitrogen-Free medium to show nitrogen fixation in *Nostoc* cyanobacterial). Where we do not supply a culture medium, the recipe may be found after the main media listing.

- A Nutrient agar
- B Malt agar
- C Acetabacter medium
- D Norris' Nitrogen-Free medium
- E Chromobacterium medium
- F Lactic acid bacteria (MRS) medium
- G Photobacterium medium
- H Yeast malt agar
- I Glucose nutrient agar
- J Vibrio natriegens medium
- K Oat agar
- L V8 medium

- M Starch agar
- N Potato dextrose agar
- O Cornmeal agar
- P Chlorella medium

PROKARYOTE SAFETY

The living bacterial cultures are carefully selected for teaching purposes, and as such most are classified as Hazard Group 1 i.e. are “unlikely to cause human disease”.

The exception is the *Vibrio* sp., which is classified as Hazard Group 2 i.e. “able to cause human disease and which may be a hazard to laboratory workers but unlikely to spread into the community...and effective prophylaxis or treatments are usually available.” Containment Level 2 handling practices should be employed with *Vibrio*. Before ordering you must ensure you can conform to this or obtain professional advice.

BACTERIAL MORPHOLOGY KEY

	Gram reaction	
	Positive	Negative
Coccus		
Rod		
Curved rod		
Comma		

Protocista - Living Cultures

Organism	each
Phylum: RHIZOPODA (Protocists with pseudopodia)	
Amoeba	
E8A17899	£18.95
Phylum: EUGLENOPHYTA (Flagellate protists, some parasitic)	
Euglena spirogyra	
E8A17905	£18.95
Phylum: CHLOROPHYTA (Green algae that form gametes and have at least two unidiploids)	
Spirogyra varians	
E8A17954	£16.95
Chlamydomonas pulsatilla	
E8A17978	£16.95
Chlorella pyrenoidosa	
E8A17991	£19.95
Phylum: CILIOPHORA (Protocists with undulating cilia)	
Paramecium caudatum	
E8A18119	£16.95

Prokaryota - Living Cultures

Organism	Culture Key	Temp (°C)	each
Acetobacter aceti Oxidises ethanol to acetic acid.			
E8A15982	C	30	£17.95
Bacillus megaterium Very large cells. Forms heat-resistant endospores. Produces lipase and protease.			
E8A16032	A	30	£18.95
Escherichia coli K12 strain			
E8A16081	A	30	£18.95
Escherichia B strain Susceptible to T4 bacteriophage			
E8A16093	A	30	£18.95
Lactobacillus casei Found in dairy products			
E8A16111	F	35	£18.95
Micrococcus luteus Divides to form tetrads, clusters or cubical packets. Yellow colonies.			
E8A16147	A	30	£16.95
Pseudomonas fluorescens Produces diffusible fluorescent pigments			
E8A16160	A	30	£19.95

Organism	Culture Key	Temp (°C)	each
Rhizobium leguminarum Symbiotic nitrogen fixer. Forms nodules on roots of legumes (pea, vetch and lentil spp. but not clover)			
E8A16172	I	25	£19.95
Sarcina lutea see <i>Micrococcus luteus</i>			
Aquaspirillum serpens Spiral rod morphology, usually found in pond water.			
E8A16184	A	30	£21.95
Staphylococcus epidermidis Forms irregular clusters. White colonies.			
E8A16196	A	35	£16.95
Streptococcus faecalis Forms pairs or chains.			
E8A16202	J	30	£21.95
Streptococcus lactis Suitable replacement for <i>S. faecalis</i> . Common contaminant in dairy products.			
E8A16214	J	35	£16.95
Vibrio natriegens Grows on highly selective medium. Used for bacterial growth experiments. Hazard Group 2.			
E8A16238	K	30	£21.95

**A eCount™ Colony Counter**

Ideal for rapid, accurate counts. All in one eCount combines a multi-function electronic counter with a Sharpie® pen for marking petri dishes to prevent missing or double counting colonies. The light, ergonomic body is balanced for easy manipulation. Touch controls for multiple counts, sums and counting up or down and more. Counter automatically beeps with each count - or select the LED flash mode for a visual alert of each count. Press the lock key to write with the Sharpie® pen without counting - makes writing the counts simple. The Sharpie® pen provides highly visible marks on both plastic and glass dishes. Store up to 32 separate counts in the memory and display the total off all counts up to 32. Counter accepts both fine and extra fine point Sharpie® pens. Use different coloured pens (not included) for separate counts. Includes one fine-point Sharpie® pen, one 3V CR1225 battery, weighted stand and free thumb button, which allows you to also use as a digital tally counter.

E8R04575each **£184.95****B Sharpie® Fine Permanent Markers**

Marks permanently on most surfaces including CDs. Fade and water resistant, non-toxic ink. Bullet tip line width 1mm.

E8R05613

Assorted

pack 12 **£9.89****C Mini Light Box**

The Mini Light Box saves bench space and can be stored away in a drawer. Viewing area 102 x 127mm is perfect for quick screening of 96-well plates, petri dishes, electrophoresis gels, slides and transparencies. Powered by two AA batteries (included). Measures 161 x 135 x 44mm. For use with the Mini Magnifier.

E8R04577each **£93.95****D Mini Magnifier**

Enlarges objects for easier viewing. Swivelling, moulded lens 1.75X magnification. Lens measures 185 x 100mm and stand measures 207mm. For use with the Mini Light Box.

E8R04578each **£73.95**



Direct Delivery

Practical Information

PACK TYPES

Each medium is normally available in a number of pack types as described below. However, some media are, for technical reasons, restricted in pack availability.

Pack A - PACK OF 10
Ready to use slopes in screw-cap vials.

Pack B - PACK OF 10
15cm³ lots in screw-cap bottles. Each vial melts within a few minutes in a boiling-water bath and the contents can be poured into the Petri dish with normal sterile precautions, but without recourse to autoclaving.

Pack C - PACK OF 2
100cm³ lots in screw-cap bottles. Though cheaper in this bulk pack, the medium takes longer to melt, with some risk of caramelisation, or contamination if not all used immediately.

Pack D
Dry powder mixes to make 1 litre - just add water

Pack E
Dry powder mixes with water to make 10 litres. Also available are dehydrated culture media in powder or tablet form.

Helpful Hint

YEAST MALT AGAR

- 4.1g Yeast extract
- 10.0g Malt
- 4.0 Glucose
- 20.0g Agar
- 1.0dm³ Distilled water

Adjust to pH 7.2 before autoclaving.

GLUCOSE NUTRIENT AGAR

- 13.0g Nutrient broth powder
- 1.0g Glucose
- 15g Agar
- 1.0dm³ Distilled water
- 3.68g di-Potassium Hydrogen Phosphate(K_2HPO_4)
- 1.32g Potassium di-hydrogen phosphate(KH_2PO_4)

OAT AGAR

- 40g Fine oatmeal
 - 15g Agar
 - 1.0dm³ Distilled water
- Boil the oatmeal in a small amount of the water. Squeeze out through muslin.
Make up to 1dm³ with water and add agar before autoclaving.

V-8 MEDIUM

- 100.0cm³ V-8 vegetable juice
- 1.5g Sucrose
- 1.5g Calcium carbonate CaCm²
- 7.5g Agar
- 400cm³ Distilled water etc.

Microbiology Media Packs

A range of culture media in ready-to-use, powder or tablet form. For media we do not list, the recipe is given at the end of the listing.

Lactic Acid Bacteria Medium

(MRS Medium)

E8A16664 Powder 500g £125.95

Malt Extract Agar

For fungi generally.

E8A16858 Powder 100g £53.95

Malt Extract Broth

E8A16883 Powder 100g £40.95

Milk Agar Powder

For the isolation of bacteria from milk.

E8A16937 100g £40.95

In addition to this list we can obtain any Oxoid medium to special order

Agar No.3

E8A16342 Powder 100g £76.95

Chlorella Medium

With trace elements solution (for suspension culture).

E8A16494 pack (et) £11.95

Nutrient Agar

For general bacteriology.

E8A16974

E8A16986

E8A16998

Powder (28g required per litre of medium).

E8A17000

E8A17012

Tablets

E8A17036

E8A17024

Nutrient Broth

E8A17048

E8A17059

Powder (13g required per litre of medium)

E8A17061

Yeast Extract

E8A17425

Direct Delivery - up to 10 days

pack (a) £30.95

pack (b) £33.95

pack (c) £29.95

100g £24.95

500g £85.95

pack 100 £27.95

pack 500 £113.95

pack (b) £35.95

pack (c) £18.95

100g £19.95

50g £21.95

Direct Delivery - up to 10 days



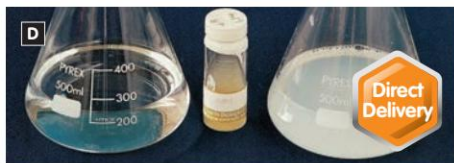
Direct Delivery



Direct Delivery



Direct Delivery



Direct Delivery



Direct Delivery

A Introductory Microbiology Kit

This kit has been designed as an introduction to the study of micro-organisms. The booklet has been written for the teacher who has little or no experience of handling micro-organisms and includes full instructions on safety, aseptic techniques, growing micro-organisms and their safe disposal. All the experiments are set out step by step and cover a range of needs from 12-year-olds to sixth-form students.

The kit could be used by a single student working through all the experiments or by a group working in parallel. The reagents, cultures and media can be stored for several months, particularly if they are refrigerated. It is possible to keep cultures for longer periods, providing they are sub-cultured on to fresh medium at intervals.

Experiments included in the teaching notes:

- Making broth cultures • Effects of temperature • Making plate cultures • Effect of antibiotics • Gram's staining
- Negative staining • Pasteurisation • Examining living bacteria • How fungi obtain food • Bacteria around us
- Looking at fungi • Bacteria in soil • The life cycle of *Mucor* • Bacteria in milk

All parts of the kit can be replaced from our extensive range of cultures, media, reagents and equipment.

Direct Delivery – up to 10 days

EBA18247

kit £303.95

B Bioluminescence Kit

The production of light by micro-organisms is a fascinating phenomenon which can easily be investigated using *Photobacterium phosphoreum*. Light emission can be used as an indicator for growth and experiments include the effects of oxygen and temperature.

This system now has a commercial application as a method of detecting microbial contamination. The isolated enzyme system is added to the specimen, the bacteria (if present)

produce ATP which powers the system and light is emitted. Light emission peaks 18-24 hours after inoculation.

Suitable for GCSE, A level/tertiary level students.

Contents:

- Culture of *Photobacterium phosphoreum*
- Glycerol/CaCO₃ agar medium
- *Photobacterium* broth medium
- Methylene blue

Sufficient for ten students/groups.

Direct Delivery – up to 8 weeks

EBA02264

kit £86.95

C The Gram Stain Kit

First developed in 1884 by Christian Gram, the Gram Stain is a fundamental technique used to identify and classify bacteria. In this instance, bacteria are stained with Crystal Violet and Grams Iodine and counterstained with Phenyl Fuchsin.

Gram positive bacteria retain the crystal violet and Iodine complex and are stained blue, whilst Gram negative bacteria are counterstained red. The teaching notes have been designed for the teacher with little experience in handling micro-organisms and include step by step diagrams of the practical procedure and the whole experiment can be done in one lesson.

The accompanying booklet entitled 'Safe Handling of Micro-organisms' includes full instructions on safety, aseptic technique, culturing and disposal.

Contents:

- *Escherichia coli* culture *Staphylococcus albus* culture • Crystal violet • Grams Iodine Phenyl-Fuchsin • Dropping bottles for alcohol • Teaching notes

Direct Delivery – up to 10 days

EBA91923

kit £43.95

D Bacterial Growth Kit

This kit enables the growth curve of a bacterium to be recorded in as little as three hours. Because of the nature of the medium, aseptic precautions are not required for most stages of the experiment. This makes it an ideal practical for GCSE pupils. The organism can be grown in a fermenter, or in individual conical flasks. Enough for ten students or groups.

Contents:

- Cultures of *Vibrio natriegens* • Agar slopes • Powdered medium • Pipettes • Logarithmic graph paper • Instruction booklet • Student's worksheet

Direct Delivery – up to 10 days

EBA23000

kit £131.95

E Health And Hygiene Project Pack

Health And Hygiene Project Pack

- How effective is toothpaste, mouthwash and deodorant?
- An effective kit to introduce the use of microbiology into everyday topics
- Hygiene, a topic which pre-occupies most teenagers
- An easy way to demonstrate the importance of hygiene whilst introducing basic microbiology.

This kit contains all the necessary information to investigate the effects of toothpastes, mouth washes, soaps, deodorants, shampoos, antiseptics and disinfectants, on the growth of microbes. Included in the kit are easy to follow instructions giving two methods for producing bacterial lawn plates and two methods for their use. Also supplied are two bacterial cultures: *Micrococcus luteus* (a Gram positive coccus) and *Escherichia coli* (a Gram negative rod).

Kit does not contain but requires the following: Petri dishes, beaker, marker pen, pipettes, filter paper cut into discs (sterile discs), tape, forceps.

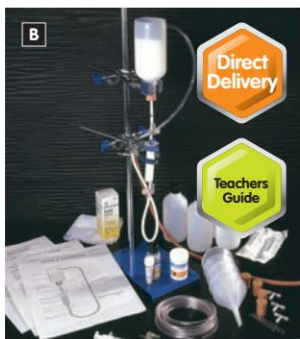
Direct Delivery – up to 8 weeks

EBA53579

kit £33.95



Direct Delivery



Direct Delivery

Teachers Guide



Direct Delivery

Teachers Guide



Direct Delivery



Direct Delivery

A Enzyme Biotechnology Kit

The development and application of new industrial enzymes is a major growth area in biotechnology. The use of micro-organisms which secrete large quantities of enzymes has in most cases replaced the more expensive traditional sources. This kit gives students a fascinating insight into the use of enzymes by industry.

Experiments include:

- Rennet in cheese production
- Protease in meat tenderisers
- Enzymes in washing powders

Sufficient for fifteen students/groups, plus sufficient material to demonstrate pectinase in fruit juice production.

Direct Delivery – up to 10 days

E8A01661

kit £49.95

B Build a Bioreactor Kit

This kit guides students through the design and manufacture of a bioreactor which can then be used to process milk or whey using an immobilised enzyme. The basis of the experiment is the hydrolysis of lactose found in milk. The reaction is monitored using diastatic urine testing strips which give an indication of the concentration of glucose present.

Student worksheets give an outline of the required features of a bioreactor – the rest is up to you! The teacher's notes give background information and guide-lines on how to use the kit. Detailed instructions of how to immobilise the enzyme, and ideas for further investigations are also included.

Sufficient for five students/groups.

Direct Delivery – up to 10 days

E8A01703

kit £185.95

C Microbiology of Yoghurt Kit

One of the oldest examples of the application of biotechnology. Nevertheless a very useful way of illustrating how micro-organisms can be used in manufacturing products and the importance of monitoring the steps along the way.

This kit investigates:

- The differential growth rates of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*
- Estimation of the total bacterial population
- Titration of acid produced
- Measuring pH
- Determination of clotting point of casein

The kit provides sufficient practical activity to occupy a normal class of students at 16+ level working in groups. The concepts included in the kit are particularly suitable for 'A' level students and for use at college level. These organisms present no particular safety problems.

Contents:

- Yoghurt starter culture
- Indicator papers
- Resazurin tablets
- Microscope slides
- Methyl violet
- Inoculating loop
- Gram's iodine
- Droppers
- Carbol fuchsin
- Pipettes, Phenolphthalein
- Full instructions are provided

Direct Delivery – up to 10 days

E8A18442

kit £95.95

D Nitrogen Cycle Kit

A collection of nine investigations for students enabling them to follow those transformations occurring in the soil which result in the recycling of nitrogen and the maintenance of fertility.

Experiments include:

- Nitrogen fixation by *Azotobacter* and *Rhizobium*
- Hydrolysis of proteins - gelatin - casein - blood protein
- Deamination of peptone
- Oxidation of ammonia and nitrite
- Denitrification of Nitrate

Direct Delivery – up to 10 days

E8A24600

kit £131.95

E Alcohol Fermentation Kit

Another very well known example of the use of micro-organisms – the production of alcohol by yeast fermentation. This kit looks at fermentation in detail comparing Anaerobic and Aerobic processes, and monitoring both the cell mass (biomass) changes and volume of alcohol produced.

It also includes setting up an immobilised cell system for comparative purposes.

Direct Delivery – up to 10 days

E8A18466

kit £113.95

A Immobilised Enzyme Kit

Enzymes have found widespread use in industrial and analytical processes and the products of whole cell metabolism are increasingly important. It has been found useful in a number of processes to employ enzymes or even whole cells in immobilised forms. The enzymes or cells are encapsulated and the raw materials passed over them, the products can then be collected continuously. This kit illustrates the basic principles of the preparation and use of immobilised biocatalysts. Experiments include:

- Entrapment of yeast cells and their use in fermentation
- Immobilised glucose isomerase - application in the sweetener industry
- Preparation and use of immobilised invertase

Sufficient for 10 students/groups.

Direct Delivery – up to 10 days

E8A01685

kit £75.95

B Genetic Modification Kit

Agrobacterium tumefaciens (crown gall) produces tumours in plants such as tomatoes and sunflowers. The bacterium 'injects' some of its DNA into the cells of the host transforming them into cancerous cells. It also causes these cells to produce substances needed by the bacterium for growth. Students inject sunflower plants with *Agrobacterium* to induce gall formation and subsequently re-isolate the bacterium and grow it on agar plates.

Contents:

- Culture of *Agrobacterium*
- Sunflower seeds
- Nutrient broth
- Nutrient agar
- Syringes, needles
- Sodium thiosulphate
- Instructions

Sufficient for 5 students/groups.

Direct Delivery – up to 10 days

E8A18508

kit £103.95

C Cheese Making Kit

Experiment kit for the demonstration of cheese making. Kit contains cheese culture cloth and a protease enzyme rennet substitute.

The culture used in this kit is a mixture of four bacteria - *Streptococcus lactis*, *Streptococcus cremoris*, *Streptococcus diacetylactis* and *Leuconostoc cremoris* - and is particularly suitable for cream or curd cheese. The rennet substitute is a protease enzyme which causes the milk to coagulate forming the 'curd'. Kit supplied with instructions.

Direct Delivery – up to 10 days

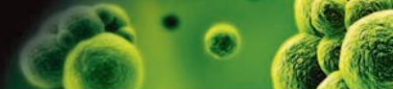
E8A16299

kit £28.95



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www.findel-international.com



Practical Information

SENSITIVITY TO ANTIBIOTICS

The growth of bacteria is affected to a greater or lesser extent by a variety of antibiotics. These reactions have implications for human beings in the treatment of disease. The items that follow allow this phenomenon to be readily demonstrated.

A Antibiotic Sensitivity Testing Kit

This kit enables students to study the reaction of two bacteria to different concentrations of the same antibiotic and to two different antibiotics.

Contents:

- Cultures of *Escherichia coli* and *Staphylococcus albus*
- 10 vials of nutrient agar
- 2 vials of nutrient broth
- 10 petri dishes
- 10 antibiotic discs Penicillin 1.5IU
- 10 antibiotic discs Penicillin 5IU
- 10 antibiotic discs Streptomycin 25µg
- Instructions

Sufficient for 10 students/groups.

Direct Delivery – up to 10 days

E8A18612

set **£95.95**

B Antibodies in Saliva Kit

This kit enables students to identify quantitatively naturally occurring antibodies Immunoglobulin A in their saliva. These antibodies are the important first line of defence against infections of all kinds and are responsible for attacking pathogens in 'external' body environments. The principle of immunodiffusion – diffusion of saliva through an agar gel containing antiserum is employed to detect the antibody. Suitable for 'A' level and college students.

Contents:

- Sodium chloride
- Petri dishes x 20
- Filter papers
- Buffered agar medium
- Anti-IgA serum
- Coomassie stain
- Microdroppers
- Sample boat
- Instructions

Sufficient for 20 students/groups.

Direct Delivery – up to 10 days

E8A02082

kit **£69.95**



Immunodiffused (Buffered agar) Medium

Direct Delivery – up to 2 weeks

E8A02100

pack 2 **£22.95**

Anti Human Ig A Serum

Direct Delivery – up to 2 weeks

E8A02136

each **£46.95**



CROSS REFERENCE

Health And Hygiene Project Pack see page 103

A Antibiotic Assay Discs

These are blank discs, to which users add their own measured quantities of antibiotic before use, to suit their specific experimental needs. Diameter: 6mm.

Direct Delivery – up to 10 days

E8BA62054 100 Disc Box box **£16.95**

E8BR0436 1000 Disc Box box **£129.95**

B Discs

To facilitate the easy handling and dispensing of sensitivity discs, these are packed in cartridges of 50 discs. It is a simple matter to slip the cartridge into the ejector provided and to dispense discs directly on to the agar plate. The cartridges have a long shelf life when correctly stored in a refrigerator.

Direct Delivery – up to 10 days

Penicillin G Discs

E8A18636 1.5 units pack 50 **£16.95**

E8A18659 5 units pack 50 **£16.95**

E8A18673 10 units 5 X pack 50 **£16.95**

E8A18648 1.5 units pack 50 **£45.95**

E8A18661 5 units pack 50 **£45.95**

E8A18685 10 units pack 50 **£45.95**

E8A18697 25g pack 50 **£16.95**

E8A18703 25g 5 X pack 50 **£45.95**

Streptomycin Discs

E8A18697 25g pack 50 **£16.95**

E8A18703 25g 5 X pack 50 **£45.95**

C Adjustable Micropipettes

These variable volume micropipettes are sturdily designed, with volumes ranging from 5-50ul and 20-200ul. They are easy to use, highly accurate and use standard micropipette tips. The volume is easily selected by twisting the top. The lightweight design and tip ejector makes operation fast and easy. A tool and instructions are included for self-calibration.

E8R05604 5-50ul each **£83.95**

E8R05605 20-200ul each **£89.95**

D Parafilm® Dispenser

Store, dispense and cut Parafilm®, tapes and labels. ABS dispenser designed with a safety razor that slides and cuts with no damage to fingers. Supplied with two easily exchangeable cutting blades. 120 x 156 x 171mm.

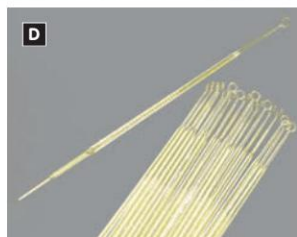
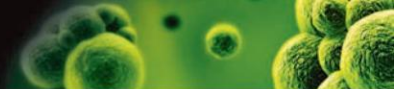
E8R05612 each **£36.95**

E Parafilm®

A semi-transparent, flexible, thermoplastic film with 2-way stretch. Non-toxic, offering good resistance to acids, alkalis and some organic solvents. Will stretch 200% and adhere to irregular shapes and surfaces to provide a secure seal. 100mm x 38m.

E8R05606 each **£35.95**

**D****E**



A Mast Rings

A paper ring with eight projecting arms, 65mm in diameter. Each arm is impregnated with a different antibiotic identified by a colour code.

Direct Delivery - up to 10 days

E8A18715

pack 10 **£19.95**

E8A18727

pack 50 **£71.95**

B Inoculating Loops

Nichrome wire with 2mm diameter loop formed at one end. For use with the Inoculating Loop Holder (Item C). Length: 50mm.

E8A64580

pack 5 **£4.19**

C Inoculating Loop Holder

Aluminium handles with chuck to take inoculating wires and loops, lockable by a screw collar. Length: 150mm.

E8A64609

each **£2.89**

D Inoculating Loops, Disposable

10µl loop at one end with a needle for stab culture or picking off colonies at the other. Sterile.

E8A64579

pack 20 **£1.68**

E L shaped spreaders

Sterile plastic spreaders for preparing lawn and spread cultures on agar plates.

E8R05406

pack 25 **£1.38**

Philip Harris Microbiology

Philip Harris Manufacturing has a long tradition of supplying high quality microscopical preparations for education both in the UK and globally. Slides are produced by hand at our Weston-super-Mare factory by skilled staff that select, fix, cut, mount and stain material to the highest standard. Coverslips are mounted with our own special recipe mountant for robustness and all slides are rigorously controlled to achieve consistent accuracy.

Our living microbiological cultures, range of growth media and exclusive kits create a complete practical learning experience for students.

A choice of bacterial and fungal cultures are grown (some to order), are quality checked, expertly packed to include relevant maintenance/safe handling notes and then despatched directly to customers.

We provide a prompt, efficient and flexible service tailored to your needs.

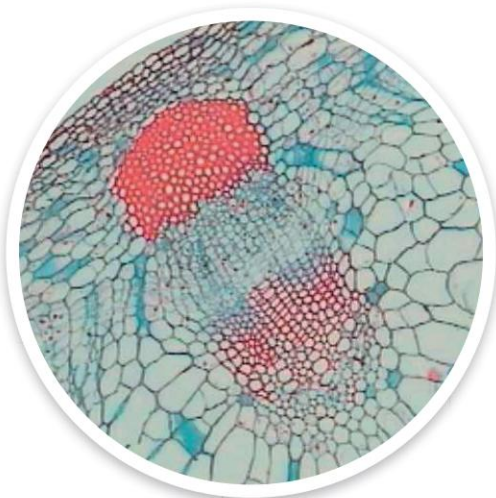


Practical Information
ABBREVIATIONS

w.m.	whole mount
t.s.	transverse section
l.s.	longitudinal section
h.s.	horizontal section
v.s.	vertical section
v.l.s.	vertical longitudinal section
r.l.s.	radial longitudinal section
h.l.s.	horizontal longitudinal section

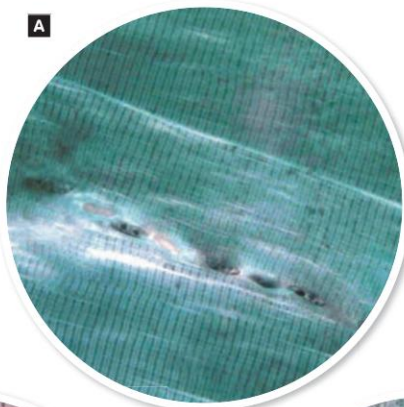
KEY TO STAINS

CV	Cresyl Violet
G	Giemsa
H	Hematoxylin
H&E	Hematoxylin and Eosin
M	Mallory
O	Osmium
S	Silver
SH	Silver Hematoxylin
S-IV	Sudan IV
V	Verhoeff
W	Wright

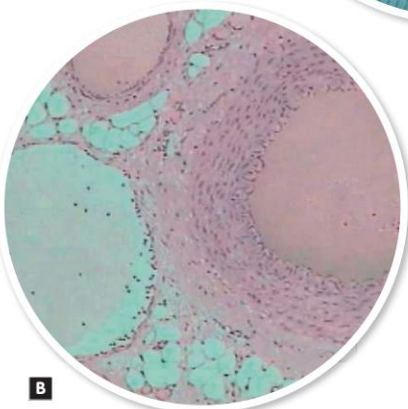




A



B



C



Images are for illustration purposes only

Biological Science Set

Set of 16 slides. Fulfills the requirements of most GCSE Biology courses. The slides have been chosen for their relevance to S2 of the National Curriculum and for the clarity with which they show structures which may be related directly to function.

A Striated mammal skeletal muscle

Human blood smear

Small intestine t.s. injected to show capillaries

Saccharomyces cerevisiae budding cells w.m.

Zea t.s. and l.s. stem

Allium root tip stained with hematoxylin

Mammal neuron motor nerve cells from spinal cord, smear.

Mammal kidney median c.s. (medulla and cortex)

Squamous epithelium from human mouth

Separate smear: *Bacillus*, *Coccus* and *Spitulum* w.m. (Gram Stain)

Allium leaf w.m. epidermis with stomata

Ligustrum leaf c.s.

B Mixed pollen w.m.

Mammal adipose tissue section

Human artery and vein, c.s.

Human scalp, hair shafts, sec.

Direct Delivery – up to 4 weeks

E8R05021

pack **£117.95**

Human Anatomy Microslide Set

C 6 slides in rack box.

Cheek cells

Aorta, t.s.

Scalp, v.s.

Blood smear

Tooth, v.s.

Eye, v.s.

Direct Delivery – up to 12 weeks

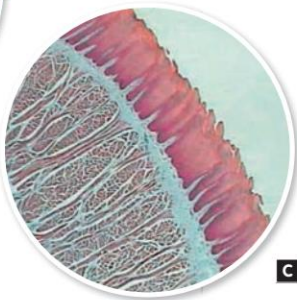
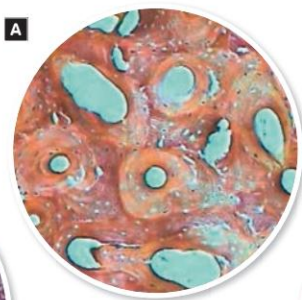
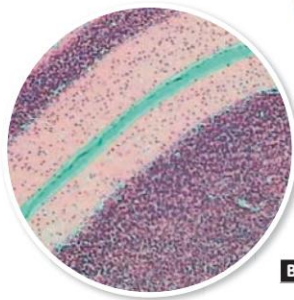
E8A08199

set **£49.95**

Practical Information

ABBREVIATIONS

w.m.	whole mount
t.s.	transverse section
l.s.	longitudinal section
h.s.	horizontal section
v.s.	vertical section
v.l.s.	vertical longitudinal section
r.l.s.	radial longitudinal section
h.l.s.	horizontal longitudinal section



Images are for illustration purposes only

Histology

These three sets build up to a complete study of mammalian histology. Basic histology is covered by set I. The addition of sets II and III gives a comprehensive collection of histology microslides which should meet the needs of most advanced courses. Teaching notes are not supplied with these sets.

Histology I

Pseudostratified ciliated columnar epithelium of trachea
Simple columnar epithelium
Squamous epithelium
Adipose tissue

A Compact bone
Striated muscle, teased
Nerve cells isolated
Spinal cord
Aorta, artery and vein
Human blood smear
Liver
Pancreas
Stomach
Ileum
Duodenum
Human scalp
Smooth muscle
Kidney
Ovary
Rat testis
Lung
Injected small intestine
Effector nerve ending
Cardiac muscle

Direct Delivery – up to 4 weeks
E8A04996

pack **£155.95**

Histology II

Areolar tissue
Hyaline cartilage
White fibro-cartilage
Compact bone, I.S.
Striated muscle, I.S.
Cerebrum
Pituitary, v.I.S.
Liver, injected
Kidney, I.S.
Lung, I.S. triple stain
Lymph node
Adrenal gland
Thyroid gland
Peripheral nerve
Heart, entire I.S.
Colon
Human plantar skin
Ureter

Sperm smear
Oviduct
Olfactory epithelium
Cochlea
Direct Delivery – up to 4 weeks
E8A05009

pack **£167.95**

Histology III

es:
Ciliated epithelium
Stratified squamous epithelium
Transitional epithelium
Cuboidal epithelium
White fibrous tendon
Yellow elastic ligament
Osteogenesis
Developing foetal phalanges
Red bone marrow

B Cerebellum
Medulla oblongata
Spleen
Thymus gland
Tongue
Salivary gland
Cardiac stomach

Fundic stomach
Pyloric stomach
Recto anal junction
Vagina
Mammary gland
Placenta
Developing tooth
Joint articulation
Appendix

Direct Delivery – up to 4 weeks

E8R05018

£111.95

Human Biology Microslide Set

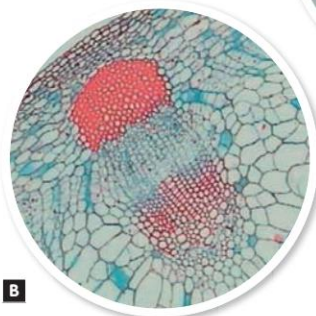
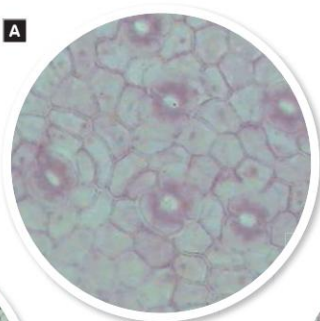
This set has been assembled to provide a range of microslides suitable for use in Biology and Human Biology courses. Teaching notes explaining the broad/general features of the slides are included with this set.

Contents:
Human blood, smear
Phagocytosis in lung
Artery and vein
Trachea, I.S.
Lung, I.S., thin section
Joint, I.S.
Bone, I.S.
Striated muscle, teased
Smooth muscle

C Tongue, v.s.
Oesophagus, I.S.
Stomach, I.S.
Small intestine
Colon, I.S.
Plantar skin, v.s.
Sweat glands
Scalp, hair insertion, sebaceous glands
Eye, v.s.
Nerve cells from spinal cord
Myelinated nerve fibres
Spinal cord I.S.

Ovary
Testis
Kidney, v.s. triple stain
Kidney, I.S.
Direct Delivery – up to 10 days
E8A04984

set **£143.95**



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Plant Structure Microslide Sets

These sets are intended to meet the needs of most advanced courses. Angiosperm Plant Structure covers general structure while Environmental Adaptations of Plants shows more specialised anatomical features. These sets do not contain teaching notes.

Practical Information

ABBREVIATIONS

w.m.	whole mount
v.s.	vertical section
t.s.	transverse section
v.l.s.	vertical longitudinal section
l.s.	longitudinal section
r.l.s.	radial longitudinal section
h.s.	horizontal section
h.l.s.	horizontal longitudinal section

Plant Structure I - Angiosperms

Ranunculus, t.s. mature root
Zea mays, l.s. root
Allium, l.s. root tip for mitosis
Cucurbita, t.s. l.s. stem
Tilia annuul ringed
Zea, t.s. l.s. stem

A Buxus, lower epidermis
Ranunculus, t.s. flower
Capsella, t.s. ovule
Triticum germinating seed
Stigma with pollen tube
Pollen grains
Ligustrum, t.s. leaf
Vicia, young root hairs
Lilium t.s. mature anthers pollen
Ranunculus, t.s. stem

B Helianthus, t.s. stem old secondary thickening
Zea, t.s. leaf

Direct Delivery – up to 4 weeks

E8A04959

pack **£105.95**

Environmental Adaptations of Plants

This set has been assembled to demonstrate specific microscopic adaptations of plants to their environments and habitats, for example stinging cells of nettle, and photosynthetic tissue in C3 and C4 plants. Teaching notes included.

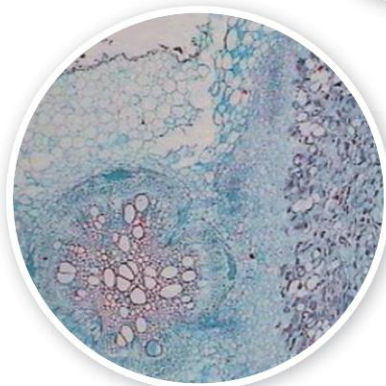
Crassulacean acid metabolism (CAM)
C3 and C4 comparative leaf t.s. vascular
Ficus, sunken stomata
Ammophila (Marram grass) t.s. leaf
Erica, Xerophyte leaf
Drosera, w.m. sundew leaf
Urtica, t.s. stem stinging cells
Solanum, l.potato t.s. storage stem
Clematis, climbing stem
Potamogeton, hydrophyte
Nymphaea, t.s. floating leaf
Mesophyte and xerophyte leaf
Dendrobium, aerial root

C Cuscuta (Dodder), t.s. host to show haustoria
Sambucus, t.s. stem lenticel
Sun and shade leaf, Fagus (beech)
Pinguicula (Butterwort), t.s. leaf
Pinus, t.s. leaf

Direct Delivery – up to 4 weeks

E8A04972

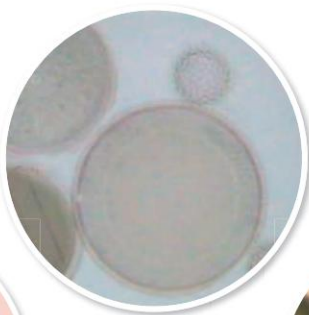
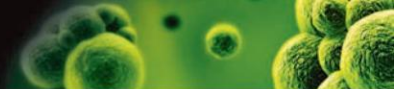
set **£111.95**



Images are for illustration purposes only

Kingdom: Prokaryotes

E8A08680	Separate smear: Bacillus, Coccus and Spirillum w.m. (Gram Stain).	each	£6.59
E8A08655	Gram +ve and -ve Bacilli w.m.	each	£10.95
E8A08709	<i>Bacillus cereus</i> , Conklines Spore Stain w.m..	each	£8.39
E8A08710	<i>Bacillus megatherium</i> w.m.	each	£5.29
E8A08771	<i>Escherichia coli</i> w.m.	each	£5.39
E8A08795	<i>Mycobacterium tuberculosis</i> in sputum, smear	each	£13.95
E8A08801	<i>Rhizobium leguminosarum</i> sec.	each	£5.29
E8A08886	<i>Anabaena</i> w.m	each	£10.95
E8A08904	<i>Oscillatoria</i> w.m	each	£8.39
E8A08898	Nostoc filaments with heterocysts	each	£5.69



Images are for illustration purposes only

Kingdom: Protoctists (Golden and yellow algae)

E8A08916	Mixed protozoa w.m.	each	£7.79
E8A08928	Amoeba proteus, selected specimens w.m.	each	£6.09

Phylum: Chrysophyta

E8A08965	Mixed freshwater diatoms, protoplasts stained, w.m.	each	£12.95
E8A08977	Mixed marine diatoms, protoplasts stained, w.m.	each	£11.95

Phylum: Euglenophyta

E8A08989	Euglena viridis, carefully differentiated iron haematoxylin staining.	each	£6.89
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Phylum: Zoomastigina

E8A09003	Trypanosoma brucei, in rat blood smear; Giemsa stain.	each	£18.95
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Class: Zygnematophyceae (Conjugating green algae with no undulipodia)

E8A09064	Spirogyra, vegetative filaments	each	£6.79
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Phylum: Chlorophyta (Green Algae)

E8A09076	Chlamydomonas, vegetative stages, w.m.	each	£8.39
E8A09088	Chlorella w.m.	each	£5.99
E8A09131	Volvox, daughter colonies, sexual stages, zygotes w.m.	each	£6.89

Phylum: Foraminifera (Forams)

E8A09167	Foraminifera w.m.	each	£15.95
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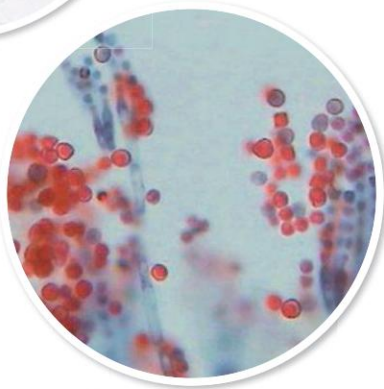
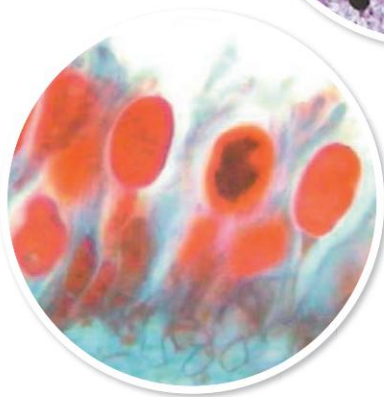
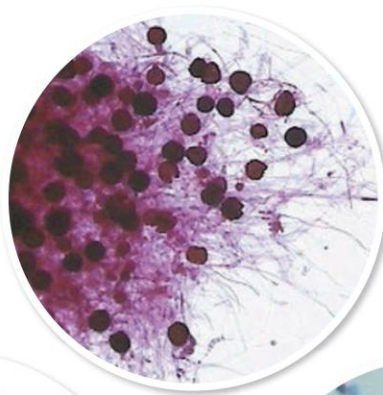
Phylum: Ciliophora (Ciliates)

E8A09179	Paramecium caudatum, careful differential staining, w.m.	each	£5.99
E8A09192	Paramecium caudatum in conjugation w.m.	each	£12.95

Phylum: Apicomplexa (Sporozoa)

E8A09271	Plasmodium falciparum smear	each	£18.95
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Direct Delivery – up to 4 weeks

All
Direct
Delivery

Images are for illustration purposes only

Kingdom: Fungi**Phylum: Zygomycota**

E8A09301	Rhizopus stolonifer, w.m. with sporangia	each	£4.29
E8A09313	Rhizopus stolonifer, w.m. with zygospores	each	£7.19

Phylum: Ascomycota (Yeasts and Moulds)

E8A09325	Saccharomyces cerevisiae [brewers yeast], budding cells. w.m.	each	£5.29
E8A09337	Sordaria fimicola, w.m. to show asci.	each	£8.39

Phylum: Basidiomycota (Smuts, Rusts, Mushrooms)

E8A09349	Puccinia, wheat rusts, t.s. host with uredospores.	each	£8.59
E8A09374	Agaricus campestris, v.s. of pileus and gills with basidiospores.	each	£7.19
E8A09386	Ectotrophic mycorrhiza, rootlets of pine or larch, w.m.	each	£6.29
E8A09398	Endotrophic mycorrhiza, in t.s. orchid root, triple stained for fungal elements.	each	£5.99

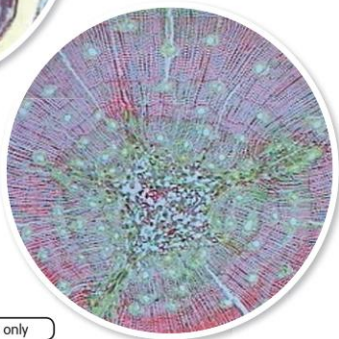
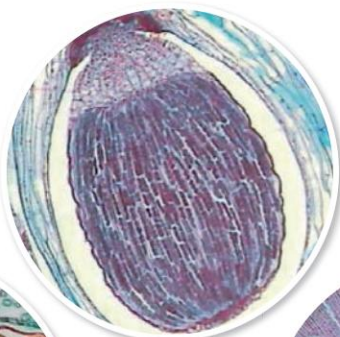
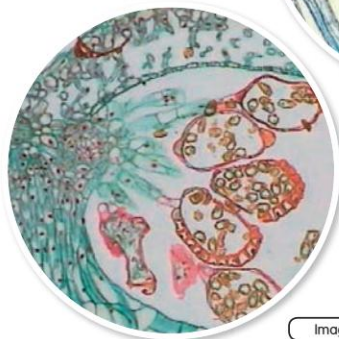
Phylum: Mitotic Fungi (Formerly Deuteromycota - Fungi imperfecti)

E8A09453	Penicillium selection on diosubstrate with hyphae and conidiospores.	each	£5.29
E8A09465	Aspergillus sp., section on substrate with conidiospores	each	£6.29

**Practical
Information****ABBREVIATIONS**

w.m.	whole mount
v.s.	vertical section
t.s.	transverse section
v.l.s.	vertical longitudinal section
l.s.	longitudinal section
r.l.s.	radial longitudinal section
h.s.	horizontal section
h.l.s.	horizontal longitudinal section

Direct Delivery - up to 6 weeks



Images are for illustration purposes only

Practical Information

FERN PROTHALLI

The control of antheridial and archegonial formation in some Filicinophytes is quite complex. Prothalli grown in crowded or adverse conditions have restricted growth and antheridia only eventually develop so they become 'male'. Well grown gametophytes (spaced out) develop archegonia first and then antheridia later, i.e. passing through a 'female' stage to the hermaphrodite condition.

Kingdom: Plants

Class: Hepaticae (Liverworts)

E8A10868	Marchantia polymorpha, v.s. antheridiophore with antheridia	each	£6.29
E8A10879	Marchantia polymorpha v.s. of sporogonium	each	£7.79

Class: Musci (Mosses)

E8A10881	Moss leaf w.m.	each	£9.59
E8A10893	Moss, l.s. of antheridial head with antheridia	each	£7.79
E8A10923	Mnium, l.s. of archegonial head with archegonia, selected to show venter and some portion of neck.	each	£9.59
E8A10935	Mnium, l.s. of capsule	each	£9.59

Class: Lycopodiopsida (Club Mosses)

E8A10984	Lycopodium, t.s. stem.	each	£8.39
E8A10996	Lycopodium, l.s. of strobilus.	each	£6.29

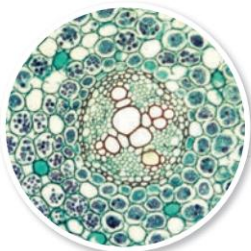
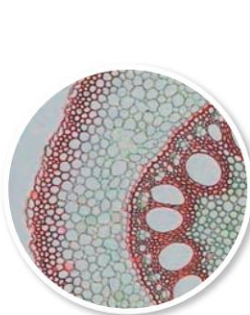
Phylum: Peridophyta (Ferns, horsetails, club mosses)

E8A11069	Dryopteris filix-Mas, t.s. pinnule with sori.	each	£7.19
E8A11095	Fern, prothallus w.m. immature, archegonia only.	each	£8.39
E8A11101	Fern, prothallus w.m. with developing sporophyte, young stage.	each	£8.49
E8A11113	Fern, prothallus w.m. with developing sporophyte first leaf emerged.	each	£9.59

Division Coniferophyta (conifers)

E8A11150	Pinus, (pine), t.s. younger root.	each	£5.99
E8A11174	Pinus, t.s. older stem with annual rings.	each	£7.19
E8A11186	Pinus, stem macerated wood, w.m. to show xylem tubes.	each	£5.99
E8A11198	Pinus, t.s. leaf.	each	£5.99
E8A11216	Pinus, pollen, w.m.	each	£4.99
E8A11228	Pinus, l.s. whole female cone 1st year. Ovuliferous scales, bract scales and developing ovules.	each	£8.39

Direct Delivery – up to 10 days



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Angiospermae (flowering plants)

Root Structure: Dicot Roots

E8A11277	Ranunculus, (buttercup) t.s. mature root with metaxylem.	each	£6.59
E8A11289	Ranunculus, t.s. young root with protoxylem only.	each	£5.99
E8A11290	Ranunculus, t.s. root, plastic embedded	each	£7.49
E8A11307	Vicia faba, (broad bean) t.s. young root hair region.	each	£6.59
E8A11332	Vicia, t.s. root tip for mitosis	each	£5.29
E8A11344	Vicia, root tip squash. Feulgen acetic - orcein stain.	each	£9.59
E8A11368	Helianthus, (sunflower) t.s. young root.	each	£6.29
E8A11379	Helianthus, t.s. old root.	each	£7.19

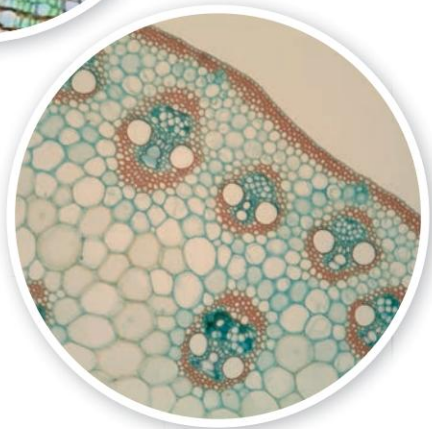
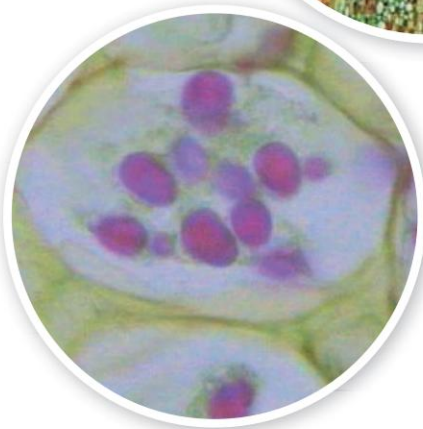
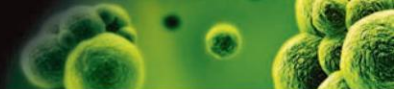
Root Structure: Monocot Roots

E8A11409	Zea mays, (maize) t.s. root.	each	£7.19
E8A11435	Allium, (onion), t.s. root tip stained for mitosis, showing all stages. Counterstained for contrast.	each	£7.49
E8A11447	Allium, root tip squash (garlic or onion), Feulgen acetic - orcein.	each	£11.95
E8A11459	Allium, root tip squash, colchicine treated, for metaphase chromosomes.	each	£5.99
E8A11460	Crocus balansa, (crocus) root tip squash, Feulgen acetic - orcein, giving all stages of mitosis.	each	£10.95
E8G86815	Rice, t.s. root.	each	£6.89

Stem Structure: Dicot

E8A11472	Helianthus, (sunflower) t.s. stem, young primary pericycle fibers unthickened.	each	£6.59
E8A11484	Helianthus, t.s. young stem, plastic embedded.	each	£6.59
E8A11496	Helianthus, t.s. stem, typical old primary.	each	£5.99
E8A11502	Helianthus, t.s. stem interfascicular cambium.	each	£6.59
E8A11514	Helianthus, t.s. stem, old secondary thickening.	each	£6.59
E8A11526	Helianthus, t.s. stem.	each	£5.69
E8A11538	Helianthus, t.s. and t.s. stem.	each	£8.39
E8A11551	Cucurbita, (cucumber) t.s. stem for sieve tubes.	each	£5.39
E8A11563	Cucurbita, t.s. stem for sieve tubes.	each	£5.29
E8A11575	Cucurbita, t.s. and t.s. stem.	each	£9.89
E8A11587	Ranunculus repens (buttercup), t.s. stem.	each	£5.69
E8A11605	Lamium (deadnettle), t.s. stem.	each	£6.89

Direct Delivery - up to 6 weeks



Images are for illustration purposes only

Stem Structure - Dicot (Continued)

E8A11617	<i>Urtica dioica</i> , (stinging nettle), t.s. stem for stinging cells.	each	£6.89
E8A11630	<i>Sambucus</i> , t.s. bark with lenticel.	each	£6.29
E8A11666	<i>Tilia</i> , (lilimel), t.s. old stem 2 - 3 years annual rings.	each	£5.29
E8A11733	<i>Solanum</i> , (potato), t.s. stem, tuber for starch.	each	£6.89

Stem Structure: Monocot

E8A11848	<i>Zea</i> t.s. and t.s. stem.	each	£5.99
E8A11861	<i>Potamogeton</i> (pondweed), t.s. stem, hydrophyte.	each	£6.29

Structure: Dicot Leaves

E8A11885	Crassulacean acid metabolism, t.s. leaf.	each	£6.29
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TO ORDER

Call

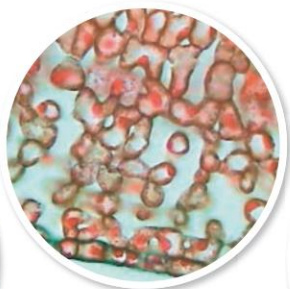
INT: **+44 (0) 115 907 4001**

ROI: **01 427 3100**

Fax

INT: **+44 (0) 115 907 4002**

ROI: **01 427 3118**



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Structure - Dicot Leaves

E8A11897	Ligustrum (privet), t.s. leaf.	each	£7.19
E8A11903	Ligustrum, t.s. leaf plastic embedded.	each	£6.89
E8A11927	Phaseolus (french bean) t.s. leaf.	each	£6.89
E8A11939	Prunus lauro-cerasus (cherry laurel), t.s. leaf.	each	£4.19
E8A11940	Impatiens t.s. and h.t.s. leaf on same slide.	each	£8.39
E8A11964	Buxus or other dicot lower epidermis, whole mount showing stomata.	each	£5.29
E8A11976	Fagus (beech), sections of sun shade leaves.	each	£5.99
E8A11988	Ficus (Fig), t.s. leaf, multiple epidermis, sunken stomata cystoliths.	each	£7.19
E8A12002	Erica (Heather), t.s. xerophytic leaf.	each	£4.69
E8A12014	Empetrum nigrum (crowberry), t.s. xerophytic leaf.	each	£7.19
E8A12038	Helianthus (sunflower), t.s. leaf.	each	£5.39
E8A12099	Nymphaea t.s. floating leaf.	each	£5.29

Leaf Structure - Monocot Leaves

E8A12129	Allium (onion), or other monocot leaf, w.m. epidermis with stomata.	each	£5.09
E8A12154	Ammophila arenaria (marram grass), t.s. xerophyte.	each	£4.39
E8A12166	Zea mays (maize), t.s. leaf.	each	£4.19
E8G80047	Sorghum, t.s. leaf.	each	£8.99

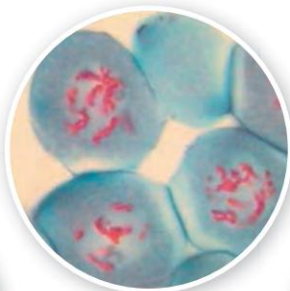
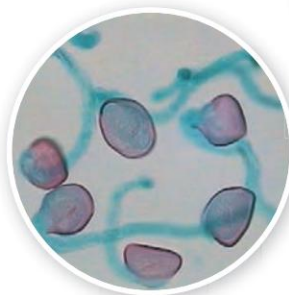
Comparative Slides

E8A12178	Monocot and dicot root c.s.	each	£7.59
E8A12189	Monocot and dicot stem, t.s.	each	£6.59
E8A12219	Mesophytic, hydrophytic and xerophytic leaf.	each	£8.69
E8A12221	Monocot and dicot leaf, t.s.	each	£6.59
E8A12245	C3 and C4 leaf, t.s.	each	£8.69

Angiosperm Reproduction

E8A12269	Ranunculus (buttercup), t.s. flower, general floral pattern.	each	£8.99
E8A12270	Lilium t.s. young flower bud for general structure.	each	£7.29

Direct Delivery - up to 6 weeks



Images are for illustration purposes only

Practical Information

LILIUM: OVULE AND EMBRYO SAC DEVELOPMENT

Though this is the traditional standard example for the teaching of embryo sac development, the actual sequence is typical only of the Liliaceae. Nevertheless, because the embryo sacs are large and mature slowly, it is likely to remain in use.

So far as we are aware, no series of clearly specified stages has been hitherto commercially available in this country. We offer the list above of carefully selected stages and ask for the following points to be borne in mind.

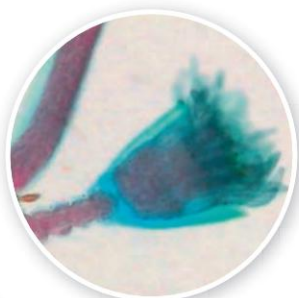
(1) All material is from the same species, , mounted serially and cut at 20 μ m.

(2) Because the diameter of the embryo sac exceeds the optimum section thickness, the same embryo sac is present on several successive serial sections. Consequently, all nuclei within the embryo sac are only occasionally present in the same section, as specified above.

Nevertheless, by simply making a composite sketch from two or perhaps three successive sections of the same embryo sac, the complete complement can be readily ascertained from the slides specified as 'in successive sections'.

Lilium Anther And Pollen Development

E8A12312	Lilium regale, t.s. of anthers during early prophase (first meiotic division).	each	£7.49
E8A12324	Lilium regale, t.s. of anthers during late prophase (first meiotic division).	each	£7.49
E8A12336	Lilium regale, t.s. of anthers during metaphase (first meiotic division).	each	£7.59
E8A12348	Lilium regale, t.s. of anthers during late first meiotic division.	each	£7.39
E8A12359	Lilium regale, t.s. of anthers during second meiotic division inc. tetrads of pollen grains.	each	£6.39
E8A12385	Germinating pollen	each	£7.59
E8A12427	Mature embryo sac, nuclei in successive sections.	each	£9.79
E8A12452	Capsella (shepherd's purse), ovule early embryo (short serial), t.s.	each	£7.79
E8A12476	Capsella (shepherd's purse), ovule cotyledon stage, t.s.	each	£7.79



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Kingdom: Animalia (animals)

Phylum: Cnidaria (coral, jellyfish, anemones)

E8A09520	Hydra, w.m. carefully extended and stained.	each	£7.79
E8A09532	Hydra, w.m. budding.	each	£8.49
E8A09568	Hydra, t.s. to show detailed structure of ectoderm and endoderm.	each	£5.69
E8A09579	Hydra, l.s. general structure.	each	£5.99

Phylum: Platyhelminthes (flatworms)

E8A09660	Planarian, t.s. triple stain.	each	£6.59
E8A09659	Planarian, w.m. specimen bleached and stained.	each	£5.99
E8A09696	Fasciola hepatica, liver fluke of sheep w.m. of carefully extended specimen.	each	£10.95
E8A09787	Taenia sp. (tapeworm), t.s. proglottid, triple stain.	each	£7.79
E8A09799	Taenia pisiformis, (dog tapeworm) ova in faeces.	each	£8.39
E8A09830	Taenia pisiformis, scolex w.m.	each	£10.95
E8A09854	Taenia pisiformis, cysticercus, scolex either everted or still inverted but clearly visible, w.m.	each	£13.95
E8A09866	Echinococcus granulosus, w.m. of complete worm, showing scolex, young, mature and gravid proglottids.	each	£12.95



Images are for illustration purposes only

Phylum: Nematoda (roundworms)

E8A09945	<i>Trichinella spiralis</i> encysted larvae in section of muscle.	each	£7.79
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Phylum: Mollusca (molluscs)

E8A09970	<i>Helix</i> sp. (snail) radula, w.m.	each	£6.89
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Phylum: Annelida (segmented worms)

E8A10005	<i>Nereis</i> , w.m. parapodium.	each	£6.89
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E8A10017	<i>Lumbricus</i> (earthworm), l.s. intestinal region, triple stain.	each	£6.89
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E8A10029	<i>Lumbricus</i> l.s. intestinal region, triple stain. Selected for insertion of chaetae.	each	£8.39
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Sub Phylum: Chelicerata (arachnids, horseshoe crabs)

E8A10145	<i>Sarcoptes</i> , the causative agent of sarcoptic mange, isolated adults, w.m.	each	£15.95
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E8A10157	Mites, w.m.	each	£7.49
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Class: Insecta (insects)

E8A10169	<i>Periplaneta</i> (cockroach), head with mouthparts entire.	each	£7.19
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E8A10182	Insect trachea, cockroach or locust.	each	£6.19
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E8A10194	Locust, head and eye in v.s. triple stain.	each	£10.95
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E8A10248	Locust, testes squash, acetic orcein and Feulgen.	each	£7.59
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E8A10259	Locust, embryo squash, acetic orcein and Feulgen squash of the young embryo.	each	£11.95
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E8A10273	<i>Drosophila melanogaster</i> (fruitfly), salivary gland chromosomes. Squash preparation stained with acetic orcein.	each	£23.95
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E8A10406	<i>Anopheles</i> , female adult, mouthparts, w.m.	each	£6.89
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E8A10443	<i>Musca domestica</i> (housefly), imago, head and proboscis entire.	each	£7.79
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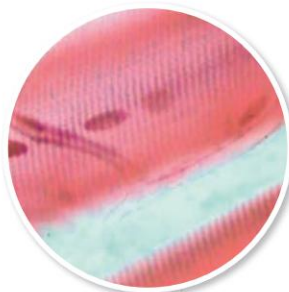
E8A10601	<i>Cimex lectarius</i> (bed bug), w.m.	each	£10.95
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Phylum: Chordata (animals with notocords, includes vertebrates)

E8A10728	<i>Scyliorhinus</i> sp., h.s. of gill arch from late embryo. Selected to show primary and secondary gill lamellae, capillary supply, respiratory epithelium etc.	each	£7.19
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E8A12529	Simple squamous epithelium, pavement tissue of frog skin.	each	£7.19
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E8A13109	Frog blood smear	each	£5.09
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Epithelial Tissue

E8A12518	Squamous epithelium, human mouth scrapings (buccal smear).	each	£6.29
E8A12531	Cuboidal epithelium, kidney tubules, section, plastic embedded.	each	£6.29
E8A12543	Ciliated epithelium, oviduct, t.s. plastic embedded.	each	£5.29
E8A12555	Pseudostratified ciliated columnar epithelium, t.s. trachea or bronchus, plastic embedded.	each	£4.39
E8A12567	Simple columnar epithelium, intestine, H & E stain, plastic embedded.	each	£5.99
E8A12579	Stratified squamous epithelium, non-keratinised, oesophagus, t.s. plastic embedded.	each	£4.69
E8A12580	Transitional epithelium, bladder section, plastic embedded.	each	£6.89

Connective Tissue

E8A12592	Areolar connective tissue, spread film; stained for collagen (white) and elastic (yellow) fibre.	each	£6.79
E8A12609	Adipose tissue, section, showing empty fat cells, plastic embedded.	each	£5.29
E8A12610	White fibrous connective tissue, tendon, t.s.	each	£5.29
E8A12622	Yellow elastic connective tissue, ox ligamentum nuchae, t.s. plastic embedded.	each	£8.39

Bone

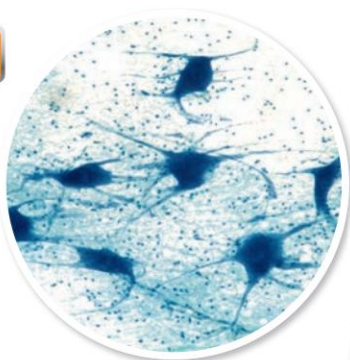
E8A12671	Joint articulation of bones, t.s. joint, triple stain.	each	£4.79
E8A12683	Compact (hard) bone, decalcified, t.s. femur.	each	£7.79
E8A12695	Compact (hard) bone, thin section, t.s. impregnated for lacunae, canaliculae, etc., plastic embedded.	each	£6.69
E8A12701	Compact (hard) bone, thin section, t.s. impregnated for lacunae, canaliculae, etc., plastic embedded.	each	£6.29
E8A12713	Red bone marrow, smear, Giemsa stain.	each	£8.09

Cartilage

E8A12634	Hyaline cartilage, section, costal rib or t.s. trachea, plastic embedded.	each	£4.19
E8A12646	Yellow elastic cartilage, section, stained for elastic fibres from epiglottis or ear.	each	£5.99
E8A12658	White fibro-cartilage, t.s. intervertebral disc.	each	£5.09

Muscular Tissue

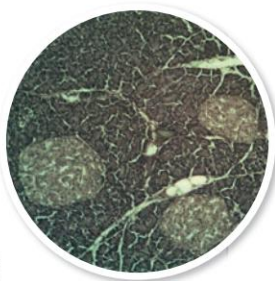
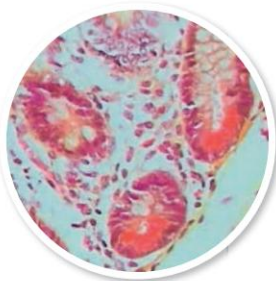
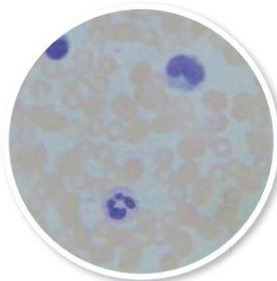
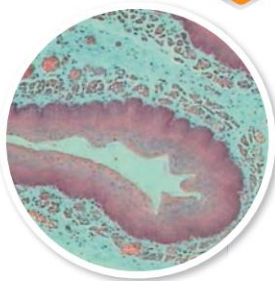
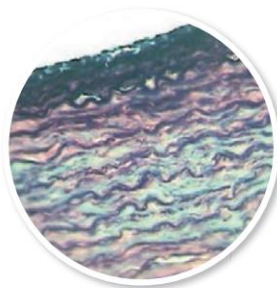
E8A12749	Striated muscle, t.s. triple stained for striations, nuclei and endomysium, etc.	each	£6.59
E8A12737	Striated muscle, t.s. selected for muscle spindles.	each	£7.19
E8A12750	Non-striated (smooth) muscle, intestinal wall, triple stain.	each	£4.79
E8A12762	Cardiac muscle, t.s. for intercalated discs.	each	£7.39
E8A12774	Cardiac muscle, t.s. for striations.	each	£6.79
E8A12786	Human cardiac muscle.	each	£7.19



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Nervous Tissue

E8A12798	Nerve cells, smear of spinal cord.	each	£7.79
E8A12816	Peripheral nerve, t.s. triple stain for general structure.	each	£7.29
E8A12828	Peripheral nerve, t.s. triple stain for general structure.	each	£6.09
E8A12839	Peripheral nerve, t.s. Myelin sheath stained by osmic, counterstained Masson or Van Gieson for perineurium etc., plastic embedded.	each	£6.89
E8A12853	Effector nerve endings, intercostal muscle.	each	£10.95
E8A12865	Pacini corpuscle (pressure receptor organ) in v.s. human skin or pancreas, triple stain.	each	£9.29
E8A12890	Spinal cord, t.s. triple stain.	each	£6.59
E8A12907	Vertebral column, t.s. to show spinal cord, ganglion and nerve.	each	£9.29
E8A12944	Cerebral cortex of rat, section.	each	£8.69
E8A12956	Human cerebral cortex, section.	each	£7.79
E8A12968	Cerebellum of rat, section.	each	£5.29
E8A12993	Medulla oblongata, t.s.	each	£9.29
E8A13006	Pituitary, v.l.s. triple stain.	each	£8.69



Images are for illustration purposes only

Circulatory System

E8A13029	Aorta and vein, t.s. to show elastic and muscular arteries and vein structure, stained for elastic fibres.	each	£8.09
E8A13031	Artery and vein, thin section, plastic embedded.	each	£8.39
E8A13067	Entire heart of small mammal showing chambers and valves, t.s. with triple stain.	each	£6.79
E8L52802	Human blood smear, stained to show red cells.	each	£17.95
E8L29828	Human blood smear, unstained.	each	£7.19
E8A13080	Human blood smear	each	£6.09
E8A13134	Liver, injected, section.	each	£8.49
E8A13158	Small intestine, t.s. injected to show	each	£8.39
E8A13169	Lung, injected, thick section.	each	£8.49

Lymphatic System

E8A13171	Lymph node, cortex and medulla, t.s. plastic embedded.	each	£6.59
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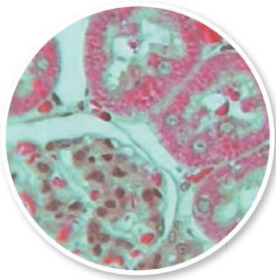
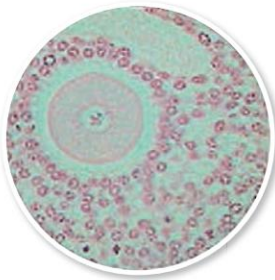
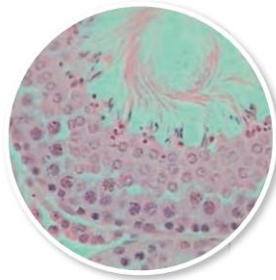
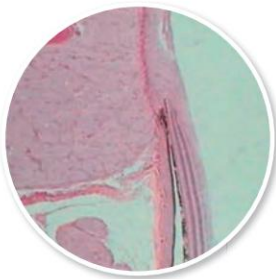
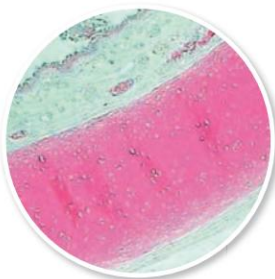
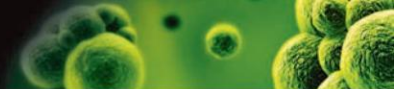
Endocrine System

E8A13213	Adrenal (Suprarenal) gland, t.s. cortex and medulla, triple stain.	each	£7.19
E8A13237	Thyroid gland, section, plastic embedded.	each	£6.59
E8A13249	Human thyroid, section.	each	£6.59
E8A13250	Thyroid and parathyroid, t.s.	each	£6.79

Digestive System

E8A13286	Tooth, human molar or canine tooth, t.s. ground section.	each	£16.95
E8A13304	Tongue, v.s. selected and stained for taste buds, plastic embedded.	each	£8.69
E8A13341	Oesophagus from rabbit, t.s. for general structure.	each	£5.69
E8A13389	Stomach, cardiac stomach, t.s. triple stain.	each	£7.19
E8A13390	Stomach, fundic stomach, t.s. triple stain.	each	£6.89
E8A13420	Stomach, stained to show mucous cells, parietal cells and chief cells.	each	£5.99
E8A13444	Duodenum, t.s. Brunner's glands, triple stain.	each	£5.29
E8A13456	Small intestine, t.s. general structure, double stain.	each	£5.99
E8A13468	Small intestine, complete t.s. from small mammal, for typical plan structure, plastic embedded.	each	£5.99
E8A13481	Mammal ileum, sec.	each	£8.69
E8A13511	Colon, t.s. large intestine.	each	£6.89
E8A13547	Liver, human, v.s.	each	£8.69
E8A13559	Liver, pig v.s. with well-defined lobules and Glisson's capsule, triple stain.	each	£4.59
E8A13584	Pancreas, for Islets of Langerhans and exocrine acini, plastic embedded.	each	£5.99

Direct Delivery – up to 6 weeks



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Respiratory System

E8A13602	Trachea, triple stain. H & E.	each	£5.39
E8A13614	Trachea, t.s. thin section, H & E, plastic embedded.	each	£5.39
E8A13638	Bronchus, t.s. plastic embedded.	each	£4.19
E8A13649	Lung, t.s. stained for elastic fibres and collagen fibres of alveolar walls.	each	£6.09
E8A13651	Lung, t.s., thin section, plastic embedded.	each	£7.19
E8A13663	Human Lung	each	£5.99

Skin and Associated Structures

E8A13687	Human scalp v.s. triple stain. Hair insertion, sebaceous and sweat glands etc.	each	£8.99
E8A13705	Human plantar skin v.s. triple stain. Heavily cornified epidermis with sweat glands.	each	£7.19
E8A13717	Human skin, general body surface, stained for elastic fibres and counterstained Masson triple for collagen fibres.	each	£9.29

Sense Organs

E8A14011	Eye, entire, v.s.	each	£11.95
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Mammalian Cytology and Cell Contents

E8A14059	Human chromosomes, normal male.	each	£17.95
E8A14084	Mitochondria, in small intestine, liver or kidney.	each	£5.99
E8A14096	Golgi bodies, in spinal ganglion, da Fano.	each	£12.95

Urinogenital System

E8R05919	Kidney, v.s. P.A.S. stains and visible haematoxylin for basement membranes and brush borders.	each	£6.59
E8A13730	Kidney, v.s., thin section, plastic embedded.	each	£5.99
E8A13742	Kidney t.s. entire organ near median plane, triple stain.	each	£7.79
E8A13754	Ureter, t.s. plastic embedded.	each	£6.59
E8A13778	Ovary, t.s., plastic embedded.	each	£5.99
E8A13789	Ovary, thin section, plastic embedded.	each	£7.99
E8A13791	Ovary, pregnant, showing corpus luteum	each	£6.49
E8A13808	Ovary, t.s. human mature.	each	£9.59
E8A13870	Pregnant uterus of rabbit, with placenta and embryo in situ, triple stain.	each	£7.79
E8A13936	Testis, rat, t.s. spermatogenesis, plastic embedded.	each	£5.99
E8A13948	Human testis, t.s.	each	£9.09
E8A13959	Human spermatozoa, smear.	each	£8.99

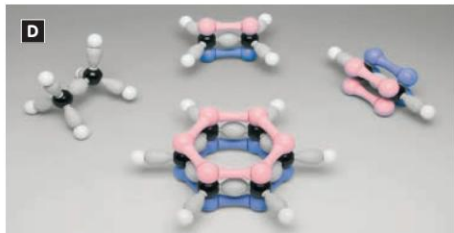
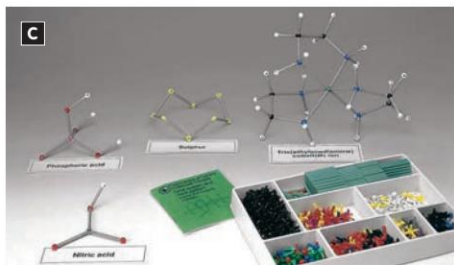
Direct Delivery – up to 12 weeks

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E exportsales@philipharris.co.uk
www.findel-international.com



A Inorganic/Organic (Student) Set

Spheres: 2 metal (1 hole), 2 metal (Ca, Mg) (2 hole), 1 metal (Be) (2 hole), 1 metal (3 hole), 1 metal (4 hole), 1 metal (6 hole), 6 halogen (1 hole), 1 oxygen (4 hole), 6 oxygen (2 hole), 1 boron (3 hole), 1 sulphur (2 hole), 1 nitrogen (3 hole), 2 nitrogen (4 hole), 6 carbon (4 hole), 1 phosphorus (3 hole), 1 phosphorus (5 hole), 14 hydrogen (1 hole), 1 beige (4 hole), 1 beige (5 hole) and 1 beige (6 hole). Links: 25 medium and 10 long flexible, 3 lone pair electron clouds.

EBA34903

set £19.95

Molymod® Component Parts

Hydrogen Atoms, White, 1 Hole

E8L77069 pack 10 £2.09

Nitrogen Atoms, Blue, 3 Hole, Triangular

E8L77082 pack 10 £3.89

Oxygen Atoms, Red, 2 Hole, Angular

E8L77070 pack 10 £3.59

Carbon Atoms, Black, 4 Hole, Tetrahedral

E8L77094 pack 10 £3.59

Long Flexible Links, Grey, Double/Triple Bonds

E8L77136 pack 25 £2.39

Medium Links, Grey, Single Bonds

E8L77124 pack 25 £2.39

B Inorganic/Organic (Teacher) Set

Designed to make a wide range of open type models, such as amines, inorganic acids, metal oxides and simple organic structures.

Spheres: 4 metal (1 hole), 3 metal (2 hole), 2 metal (3 hole), 4 metal (4 hole), 1 metal (6 hole), 14 carbon (4 hole), 6 carbon (5 hole), 12 hydrogen (1 hole), 2 hydrogen (2 hole), 6 nitrogen (4 hole), 4 nitrogen (3 hole), 13 oxygen (2 hole), 4 oxygen (4 hole), 5 oxygen (1 hole), 8 sulphur (2 hole), 4 sulphur (4 hole), 1 sulphur (6 hole), 4 phosphorus (4 hole), 1 phosphorus (5 hole), 2 phosphorus (3 hole) and 8 halogen (1 hole). Links: 38 grey medium, 12 purple medium, 36 long flexible. Atomic orbitals: 6 pink unhybridised p-orbitals, 6 purple unhybridised p-orbitals, and 6 lone pair of electrons lobes.

EBA34897

set £40.95

C Orbit Organic And Inorganic Chemistry Set

This molecular modelling class set contains 540 atom centres with two booklets covering organic and inorganic molecules at a more advanced level.

EBA35257

set £55.95

D Molecular Orbital Organic Structures Set

This set consists of sufficient parts to make models of benzene, ethane, ethene and ethyne. These exclusively designed models help to demonstrate both sigma-bonding and pi-bonding and therefore the concept of electron delocalisation and orbital hybridisation.

Spheres: 2 carbon (6 hole), 8 carbon (5 hole), 2 carbon (4 hole), 18 hydrogen (1 hole), 9 carbon-carbon bond shaped sigma-bonds, 18 carbon-hydrogen (pear shaped) sigma-bonds, 9 pi-bonds (21 pink and 21 purple pieces).

E8F59118

set £40.95

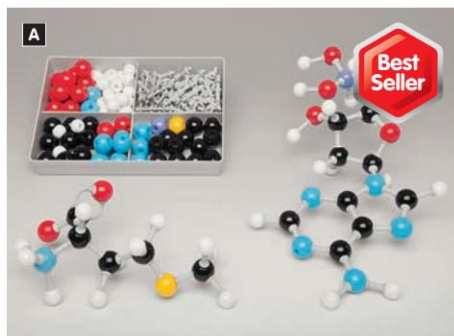
E Shapes of Molecules Set - Electron Repulsion Theory

Contains sufficient parts to make eight atomic models. Each model is an example of the different orientations of the bonds and cover co-ordination numbers 1 to 6. Lone pairs are represented by brown spheres or brown pear shaped parts. The latter is useful as protonated models of NH_4^+ & H_2O^+ may be built, thus demonstrating Acid/Base theory.

Spheres: 1 carbon (4 hole), 1 oxygen (4 hole), 1 nitrogen (4 hole), 1 sulphur (6 hole), 1 phosphorus (5 hole), 1 chlorine (4 hole), 1 boron (3 hole), 1 metal (beryllium) (2 hole), 7 chlorine (1 hole), 9 fluorine (1 hole), 13 hydrogen, 6 circular lone pair orbitals, 6 pear shaped lone pair orbitals. Links: 26 grey pear shaped sigma bonds, 6 short links to be used with circular lone pairs.

E8F59099

set £20.95



A Biochemistry (Student) Set

An open-type structure set.

Atoms:

- 12 carbon atoms (black, 4 hole, tetrahedral)
- 9 carbon atoms (black, 3 hole, trigonal)
- 11 oxygen atoms (red, 2 hole, angular)
- 2 oxygen atoms (red, 1 hole)
- 3 nitrogen atoms (blue, 4 hole, tetrahedral)
- 6 nitrogen atoms (blue, 3 hole, trigonal)
- 2 nitrogen atoms (blue, 2 hole, angular)
- 1 sulphur atom (yellow, 2 hole, angular)
- 1 phosphorus atom (purple, 4 hole, tetrahedral)
- 22 hydrogen atoms (white, 1 hole)
- 3 hydrogen atoms (white, 2 hole, angular)

Bonds:

- 40 medium links (grey, single bonds)

E8A34940

set **£23.95**

B Organic (Student) Set

This set can be used to make models of many organic molecules and also to illustrate various forms of isomerism in organic systems.

Atom parts are made of solid plastic spheres and are available with from 1 - 6 holes in the usual angular orientations.

The contents are contained within a plastic storage box.

Contents of the Molymod organic chemistry set for students include:

Atoms:

- 20 hydrogen atoms (white, 1 hole)
- 12 carbon atoms (black, 4 hole, tetrahedral)
- 2 nitrogen atoms (blue, 3 hole, trigonal)
- 2 nitrogen atoms (blue, 2 hole, angular)
- 6 oxygen atoms (red, 2 hole, angular)

- 1 sulphur atom (yellow, 4 hole, tetrahedral)
- 1 sulphur atom (yellow, 6 hole, octahedral)
- 4 halogen atoms (green, 1 hole)
- 1 metal atom (grey, 1 hole)
- 1 phosphorus atom (purple, 4 hole, tetrahedral)

Bonds:

- 26 short links (white, all bond types)
- 26 medium links (grey, single bonds)
- 10 long flexible links (grey, double/triple bonds)

E8A34885

set **£19.95**

C Organic (Teacher) Set

The Molymod organic set can be used to make any number of simple molecules and is designed for those needing to make many models, such as teachers and lecturers.

The atom parts are made of solid plastic spheres and are available with from 1 - 6 holes in the usual angular orientations.

The contents are contained within a sturdy plastic storage box.

Contents of the Molymod organic teacher set include:

Atoms:

- 24 carbon atoms (black, 4 hole, tetrahedral)
- 6 carbon atoms (black, 5 hole, trigonal bipyramidal)
- 2 carbon atoms (black, 2 hole, linear)
- 6 carbon atoms (black, 3 hole, trigonal)
- 12 oxygen atoms (red, 2 hole, angular)
- 40 hydrogen atoms (white, 1 hole)
- 4 nitrogen atoms (blue, 4 hole, tetrahedral)
- 1 sulfur atom (yellow, 4 holes, tetrahedral)
- 1 sulfur atom (yellow, 2 holes, angular)
- 4 phosphorus atoms (purple, 4 hole, tetrahedral)
- 8 halogen atoms (green, 1 hole)
- 2 metal atoms (grey, 1 hole)
- 1 metal atom (grey, 2 holes, angular)

Bonds:

- 55 medium links (grey, single bonds)
- 25 long flexible links (grey, double/triple bonds)
- 60 short links (white, all bond types)
- 6 pink unhybridised p-lobs, 6 purple unhybridised p-lobs and 6 lone pair of electrons lobes.

Tool:

- 1 Tool (used for disassembling models containing short link bonds)

E8A34873

set **£40.95**

D GCSE Molecular Model Set

Designed for student use and is ideal for demonstrating simple organic features such as alkanes, alkenes, alcohols, aldehydes, ketones and esters. Components are packed in eight bags and the kit is suitable for eight groups of two pupils.

Atoms:

- 4 carbon atoms (black, 4 hole, tetrahedral)
- 2 oxygen atoms (red, 2 hole, angular)
- 2 halogen atoms (green, 1 hole)
- 10 hydrogen atoms (white, 1 hole)

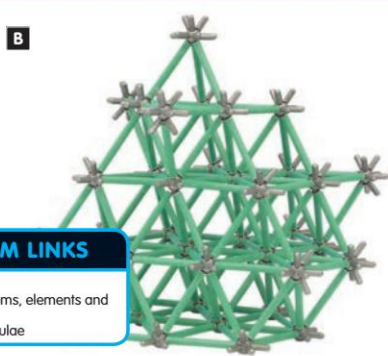
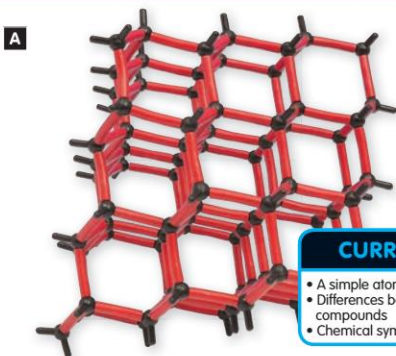
Bonds:

- 20 medium links (grey, single bonds)
- 4 long flexible links (grey, double/triple bonds)

E8A34861

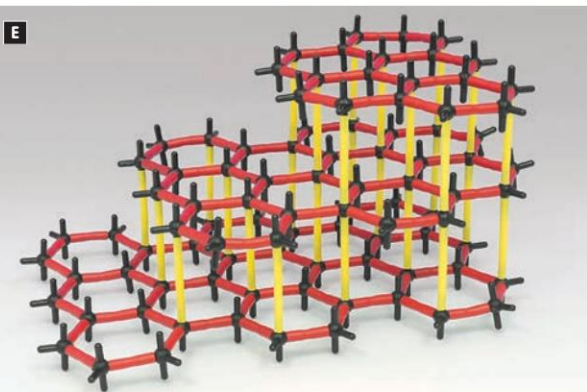
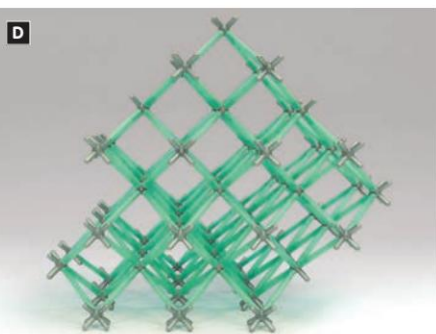
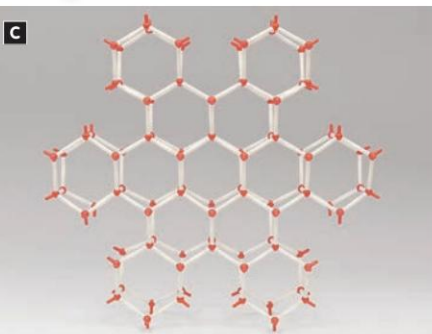
set **£77.95**

Robust models containing sufficient atoms to see the relationships between structure and physical properties. Easy-to-build, low-cost kits; students learn as they follow the building instructions and model descriptions.



CURRICULUM LINKS

- A simple atomic model
- Differences between atoms, elements and compounds
- Chemical symbols, formulae



A Diamond Model

Shape: Octahedron, Height: 22cm, 84 carbon atoms.

E8R04272

each **£10.95**

B Copper Model

Shape: Irregular, Height: 17cm, 38 copper atoms.

E8R04275

each **£13.95**

C Ice Model

Shape: Snowflake, Diameter: 36cm, 96 oxygen atoms.

E8R04287

each **£10.95**

D Iron Model

Shape: Irregular, Height: 20cm, 71 iron atoms.

E8R04288

each **£15.95**

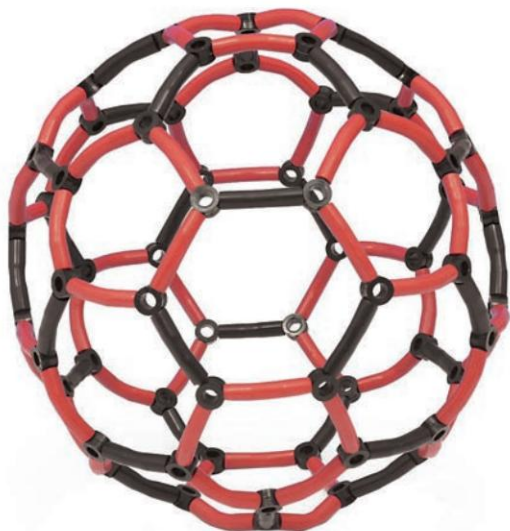
E Graphite Model

Shape: Three layers, Height: 16cm, Width 22cm, 94 carbon atoms.

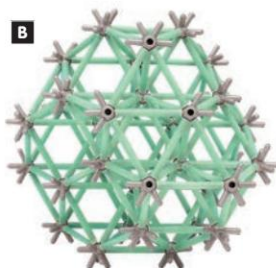
E8R04286

each **£10.95**

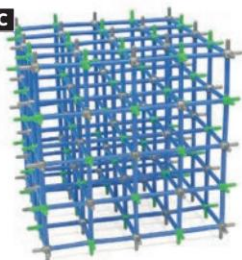
A



B



C



D



A Carbon 60 Model

Shape: "Bucky-ball", Height: 15cm, 60 carbon atoms.

EBR04273

each **£8.09**

B Magnesium Model

Shape: Irregular, Height: 14cm, 38 magnesium atoms.

EBR04274

each **£15.95**

C Sodium Chloride Model

Shape: Cube, Height: 20cm, 125 sodium and chloride atoms.

EBR04285

each **£15.95**

D Carbon Nanotube Model Kit

Carbon nanotubes are currently one of the most intensively studied nanomaterials with their unique molecular structure resulting in several potential exciting applications in current day nanoscience.

Using this kit you can make a graphene sheet, carbon nanotube, carbon 60 (buckyball) and related structures with up to 260 carbon atoms.

Instructions show how the carbon atoms can be arranged to illustrate the different symmetries of carbon rings in the nanotube to create the chair, zigzag and chiral structures.

The kit uses the Mini molecular building system and contains 260 atoms to make a nanotube model 50cm long.

EBR05246

each **£28.95**

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exportsales@philipharris.co.uk

A



Putting It All Together - The Writing Formula

Understanding that the vast range of different substances are combinations of relatively few elements is a cornerstone of Chemistry.

The Philip Harris Formula Model gives students a simple, hands on model to explore chemical bonding.

A Formula Finder

Using a simple 'Jigsaw' analogue, the model provides a dynamic, visual and tactile method to see which combinations work and which don't. Magnetic pieces (that can be used on the same back board as the Structure and Bonding kit) are used to represent different elements or functional groups and to allow the construction of simple 'ionic' compounds. The visual nature of the jigsaw pieces make it easy for students to work out the ratios required to achieve a neutral compound.

In the class kit you receive six single kits.

EBR02334	Single Kit	each £43.95
EBR02648	Class Kit	kit £239.95

B

Our Own Design

Best Seller



Atomic Power! Give your students a powerful tool to aid their understanding of atomic structure, the periodic table and each element's place within it.

B Structure and Bonding Kit

Using the Philip Harris Atomic Structures and Bonding model, students can explore (individually and in groups) atomic structure with enough components to build two atoms up to Atomic number 20 (i.e. calcium).

The model consists of a magnetic backing board and magnetic pieces that together allow students to gradually build up the nucleus and orbitals as required for the atom being modelled.

Additionally the kit enables modelling of the three types of bonding taught at GCSE; ionic, covalent as well as the ability to explore isotopes.

In the class kit you receive eight single kits.

EBR02330	Single Kit	each £47.95
EBR02333	Class Kit	kit £343.95

CURRICULUM LINKS

- A simple atomic model
- Differences between atoms, elements and compounds
- Chemical symbols, formulae

B Solid Materials Kit

A variety of materials in the form of rectangular blocks, intended to familiarise the student with the appearance, 'feel', texture, hardness and density of a range of common substances. The kit comprises of:

- Blocks, 50 x 40 x 30mm: Softwood, hardwood, paraffin wax, aluminium, iron, foamed polystyrene.
- Blocks, 20 x 20 x 100mm: Perspex, glass, slate, aluminium, softwood, marble
- Blocks, other sizes: Lead 50 x 50 x 20mm, aluminium 50 x 50 x 80mm, hardwood 50 x 50 x 200mm, brass 20 x 20 x 50mm, iron 40 x 40 x 20mm.

E8L12750

pack **£137.95****B Kinetic Theory Model**

For the qualitative representation of the various aspects of the kinetic theory of gases. Consists of a clear Perspex tube 460mm long x 50mm outside diameter provided with a freely sliding expanded polystyrene piston and a loose-fitting metal cap.

The tube is mounted upon a plastic box 140 x 115 x 120mm high containing an agitator piston driven by a low voltage d.c. motor.

The apparatus is supplied complete with a supply of 3mm diameter phosphor bronze spheres, four cardboard loading discs and detailed operating instructions.

Dimensions: 140 x 115 x 550mm high.

E8H25365

each **£82.95****C Charles Law**

Comprising of a U-shaped glass 15mm in diameter with one plain limb 220mm long, one graduated limb, overall length 120mm limb graduated 25 to 35 x 0.2ml, terminating in a bulb 37mm diameter with third limb 185 x 6mm length x bore, jointed at right angles to the plain of the other two. Short length of the rubber tubing with two pinch clips on short length of glass tubing mounted at end of wide-bore plain limb with rubber bung. With tall form beaker 1000ml capacity and stirrer. All glass parts made from Borosilicate glass. Size: H30 x W18 x L25cm.

E8R05964

each **£29.95****D Whitley Bay Smoke Cell**

For the observation of 'Brownian Motion' in smoke particles. Consists of a box with plastic lid as well as flanges that allow easy attachment to a standard microscope.

The box contains a smoke cell, cylindrical condensing lens and a 12V 3W festoon bulb. Apparatus is pre-set to focus the light at correct height. The set is supplied complete with detailed instructions and a squeeze bottle type smoke generator. Dimensions: 90 x 46 x 20mm.

E8H25389

each **£25.95****E Steam Jacket And Syringe**

For determining the molar mass of volatile liquids with a boiling point below 80°C, steam being used to vapourise the sample. The graduated syringe is surrounded by a borosilicate glass jacket supported in place by two rubber bungs also carrying an inlet and outlet tube for the steam, with a hole to accommodate the thermometer. Dimensions:

Syringe 0-100cm³ x 0.1cm³, overall length 215 x diameter 60mm. Supplied WITHOUT thermometer.

E8A34629

each **£136.95****Best Seller****New**

Spares
and
Accessories

Festoon Bulb

12V 3W for use with Whitley Bay smoke cell, and multiple light sources.

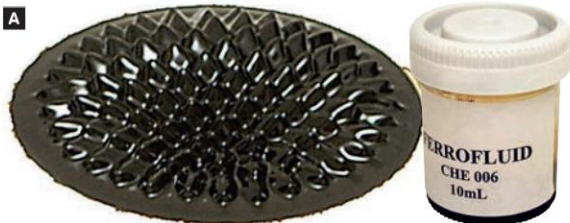
E8R01297

each **£1.32****Cover Glasses**

Number: 11/2. Thickness: 0.16/0.19mm. For Whitley Bay Smoke Cell.

E8R01766

box 100 **£5.99**



A Ferrofluid, 10mL

The amazing Ferrofluid is a truly magnetic liquid that consists of micron size magnetic particles (magnetite) in a mineral oil. Particles are coated in a surfactant which prevents them clumping together.

When a magnet is in close proximity the magnetic particles in the Ferrofluid take up the shape of the magnetic field – a 3D version of the classic iron filings on a piece of paper experiment.

The apparent density of ferrofluid can be changed by applying a magnetic field, e.g. place a one penny piece in a shallow dish (5mm) of ferrofluid and it will sink. Bring a powerful magnet underneath and the coin will float!

Supplied in a plastic jar containing 10mL of Ferrofluid. A rare earth magnet is also supplied.

E8R05624

each £11.95

B Slime

Slimes will change shape to match their container, but will "snap" if pulled strongly and quickly. Slime may dry out after use, so sealing the container after use will extend its life (adding a few drops of water may help). 3 assorted colours, 140g of each.

Direct Delivery – up to 10 days

E8R00371

pack 3 £18.95

C Modern Materials Pack

An introduction to smart materials.

Man has long been fascinated by the visually curious; the iridescence of insect carapaces and bird feathers, the lustre of pearl and related materials. Other properties have been turned to our advantage with modern materials offering many new and exciting possibilities and applications.

This pack contains natural and manufactured materials that have micro and nano structures resulting in macro properties – abalone shells (nano), leathers (micro) plus nano flakes, breathable fabrics, Kevlar cloth, carbon fibre, Polymorph, Expancel, light-reflective and glow-in-the-dark films.

E8R02327

pack £41.95

D Putty

Putty will bounce if dropped, but will flow if gently stretched. Roll it up into a ball and leave on a worktop, you will see that it slowly flows, gradually flattening.

Direct Delivery – up to 10 days

E8R00382

Orange

tub £9.95

E8R00383

Blue

tub £9.95



E Polymorph - Malleable Smart Polymer

Polymorph is one of a new generation of commercial polymers set to have a major impact on model making and prototyping. This polymer has all the characteristics of a tough "engineering" material yet it softens and becomes easily malleable at just 62°C. It can be heated with just hot water or a hairdryer and moulded by hand to create prototypes and solve manufacturing problems currently outside the capacity of other materials. 500g.

E8R02325

kit £20.95

F Polyox - The Self Siphoning Liquid

Polyethylene oxide in a non-toxic, long-chain polymer with a high molar mass that is also soluble in water thanks to its extensive hydrogen bonding.

A solution of Polyox (approximately 1% w/v) behaves as an "elastic liquid" i.e. it "self-siphons". If you quickly drag some of the solution from a beaker with a spatula or spoon, it will continue to move out of the beaker. You can even draw it up into a syringe even though the tip of the syringe is above the liquid level.

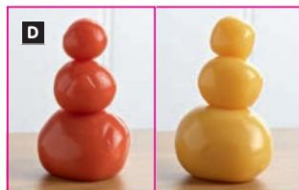
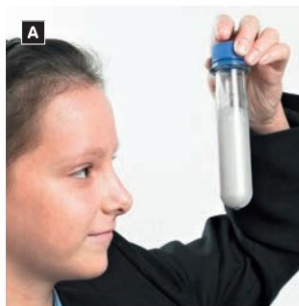
(5g is sufficient to make about 500cm³ of the fluid).

Supplied in 50g pack. Bulk orders will be supplied in a single bag.

Please note: Propan-2-ol is required for use with this item but should be available at most, if not all schools.

E8R02324

kit £8.09



A Pearl Swirl™ Fluid

Pearl Swirl™ Fluid is the secret ingredient that gives some shampoos that pearly-white look or creates wave currents in some shake-up water toys. In scientific terms, Pearl Swirl is a rheoscopic fluid, but it's a concentrate that makes 2 gallons! When added to water (or other liquids), it allows you to see the movement or currents in the liquid. This pearly-white, water-based suspension is safe and non-toxic and excellent for teaching units on ocean currents, aerodynamics, turbulence, convection, and many other motion effects that are often difficult for students to visualise. Contains a 113ml bottle of Pearl Swirl™ concentrate to make up to 2 gallons of rheoscopic fluid.

E8R05254 each **£29.95**

B Hydrochromic Paint

An amazing paint formula which changes from opaque to transparent when it gets wet. Typically the paint is applied over an image to produce a plain white surface as the paint dries. If the surface is then brushed over with water the hidden image is revealed. As the surface dries it returns to its opaque state. Size: 50ml.

E8R05744 each **£10.95**

C Photochromic Pigments

These pigments normally have a pale, off-white appearance but in sunlight or UV light they change to a bright, vivid colour. The pigments revert to their pale colour when away from sunlight or UV light.

The active photochromic dye is contained in micron-size microcapsules dispersed in water to make up the pigment, which has the consistency of thick cream. If the pigment is mixed with a binder, such as an acrylic base, it can be

permanently applied to almost any surface. The practical applications of the pigments are almost limitless. Uses range from UV warning systems to 'smart graphics' in publications and packaging and garment design. Methods of application include brush painting, block printing, stenciling, screen printing etc. 3g supplied in a plastic syringe.

E8R05255 Magenta each **£3.49**

E8R05257 Purple each **£3.49**

E8R05256 Orange each **£3.49**

D Smart Putty

Smart putty is a highly versatile and remarkable property: it changes colour in the palm of your hand from orange to yellow and can also change in characteristics. It usually behaves as a soft mouldable plastic like chewing gum, but instantly becomes a rubber if impacted and bounces like a ball. It can also float in a liquid and will form a puddle given enough time. It is a great demonstration of an unusual polymer, a useful adhesive and can be used in many creative and fun activities. 100g pack.

E8R05259 each **£8.99**

E Hydrogel

This completely non-toxic powder absorbs up to 500 times its own weight in water and is the 'secret' ingredient used in applications ranging from babies nappies to perpetual growing plants. When exposed to water, the powder transforms into a gel which holds the water for an extended period. 500g bag.

E8R05263 each **£10.95**

F Thermochromic Pigments

These thermochromic pigments are made up as a liquid paste compatible with any acrylic media. At normal room temperature the pigment appears coloured, but at 27°C the colour disappears. When the temperature falls, the pigment colouring re-appears. 5ml supplied in a plastic syringe.

- The ratio of acrylic base to colouring pigment depends entirely on the application and density of colour required
- When heated, each colour turns into the colour of acrylic base used
- Water soluble for easy cleaning and diluting

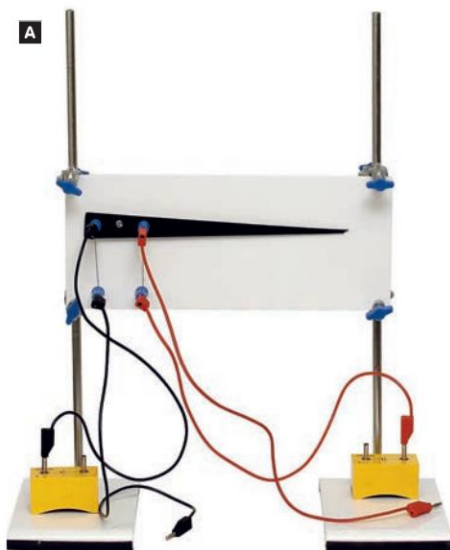
E8R05260 Orange each **£3.59**

E8R05261 Green each **£3.59**

G Chameleon Nano Flakes

This material consists of nano-size silicon flakes each covered with a titanium compound. The flakes possess amazing light scattering properties if mixed with clear varnishes or polymers. An object thus coated will change colour completely according to the viewing angle. The material can be mixed into practically any clear medium to produce optical 'fireworks' and colour-changing characteristics. 5g approx. 20ml pot colour shift: red to green. Please note: this small quantity covers a huge area as a surface finish or fills large volumes if embedded in clear resin etc.

E8R05258 each **£7.19**



A Smart Wires and Muscle Kit

The smart wire demo kit provides a clear and simple way of introducing the principles of the shape memory effect. The kit uses two pieces of thin smart wire connected to a lever on either side of a pivot. When a battery is connected to one of the smart wires, the wire contracts (by about 5%) and the lever moves. If the battery is disconnected, and current is now passed through the other wire, the lever moves back in the opposite direction. Stackable plug leads and cell holder not included.

E8R05773

pack **£95.95**

B Electrolyca Strip

This material looks and feels like ordinary Lycra but is highly conductive. It can be cut into narrow strips to form conducting 'wires' or can be used as a soft compliant substitute for metal and foil in switches and sensors. Amazingly, its conductivity depends how tightly it is stretched so if you pull it, the resistance increases (and drops again when stretched very tightly). In a thin strip, the material also warms up when current is passed thus provides the basis of a heated garment or product such as a hat or gloves. 100 x 1450mm strip. BEK and leads not included.

E8R05262

each **£38.95**



C Science of Smart Alloys Pack

Many of the GCSE specifications starting in 2006 refer to the use of smart alloys and shape memory alloys.

This pack contains a variety of smart alloys including a two-way memory spring, smart spring, smart wire, memory wire, superelastic wire and wire holders for securing the materials. There are many practical activities that can be done with the alloys and are described in the accompanying SEP booklet 'Metals and smart alloys'.

E8R02328

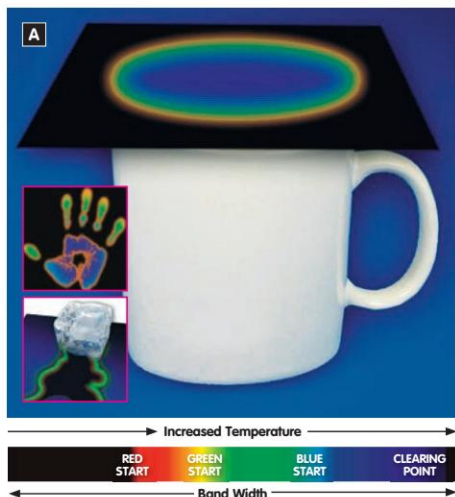
pack **£40.95**

D NiTi Memory Wire

This nickel/titanium (NiTi) alloy initially 'remembers' that it should be straight. If it is bent into a different shape and then dropped in very hot water (90°C), it springs back to its original straight condition. It will repeat this behaviour any number of times. The wire can also be heat treated to remember different shapes. It simply has to be held in the desired shape and then heated to 500°C in a small oven for a few minutes. This means that pupils can now get involved in creating smart springs and other components that a few years ago would have challenged front line researchers. 0.50mm diameter x 1m length.

E8R05264

1 metre **£9.59**



A Thermocolour Sheets

Thermocolour sheets are self-adhesive and consist of a thin layer of liquid crystal that has been printed on to a black background. Liquid Crystals are organic chemicals with twisted helical molecular structures, which expand, or contract with increases or decreases in temperature, not unlike a spring. The result is different wavelengths of incident light being reflected from the slightly changing structure, which our eyes see as changing colours. As the temperature increases above a given point the sheet changes from black to red to green to blue. The sheets can be made in a variety of temperature ranges but the most common temperature used in school science projects is 25°C and has a 5°C band-width of green. Liquid Crystal is highly accurate in its temperature reading and completely safe to use in the classroom. These sheets can be used in a wide variety of Science experiments. The sheet size is 150 x 300 mm however you can cut the sheet as most experiments can be conducted using much smaller pieces.

Thermocolour Sheet - 20 to 25°C

E8R03240 each £11.95

Thermocolour Sheet - 25 to 30°C

E8R03241 each £11.95

Thermocolour Sheet - 30 to 35°C

E8R03242 each £11.95

B Radiation Absorption Kit

The kit contains four aluminium discs, each having a different durable finish: matt black, mirror black, matt silver and mirror silver. Bonded to the reverse of each disc is a Liquid Crystal thermometer measuring 30°C to 65°C in 5°C increments. The Liquid Crystal device on the disc is easy to read and shows how absorption of heat radiation depends on surface colour and texture. The discs react very quickly to a heat source such as infrared or a bright light, giving fast results, so more experiments can be completed in each lesson. The discs can be used to investigate rates of cooling, the effects of filters and reflectors, inverse square law and equilibrium between absorption and emission. The discs are supplied as a set of 4 with a holder in a storage box. The indicated temperature is read when the segment is green. When heating the disc the segments appear brown, then green, then blue, before returning to black. If STOP appears the heat source should be removed immediately.

E8R03236

kit £43.95

C Ultraviolet Detecting Beads

A fun way to learn about the power of sunlight. As well as making bracelets, pupils are able to carry out fun experiments investigating solar radiation, effectiveness of sunscreen and sunlight. A science activity guide is included and allows children to carry out scientific investigations and learn about the effects of the sun on their health.

- Observe radiation from the Sun at different times of the day
 - Test the effectiveness of glass in blocking the Sun's rays
 - Test the effectiveness of different SPF sun screens
- A bag of white beads that turn into many different colours when exposed to an ultraviolet light source. Ideal for observing UV radiation from the Sun. Beads are drilled so that they can be threaded onto pipe cleaners or string. A great way to raise awareness of the health issues associated with exposure to the sun. Ages 4+.

Direct Delivery - up to 10 days

E8L87724

pack 500 £25.95



Dry ice is vital for many activities and great fun when used safely.

- Always ensure a responsible adult is in charge and never allow the use of dry ice unsupervised
- Always handle dry ice with protective gloves or use a scoop
- Always use in a well ventilated area
- Do not place in any airtight containers; dry ice sublimates quickly and will rapidly build up pressure

To create the perfect fog effect add hot water to dry ice in the ratio 1 litre to 200g of ice. The fog can be a small table top effect or something to wow an assembly - just scale up. The white fog created is an aerosol of tiny droplets of water that refracts the light and this is why it's white - just like a real cloud! Add flavoured squash to create a fruit cloud.

The instructions within the Hardware pack show how to make soap bubbles, metal scream, learn about fire extinguishers, hovercrafts, vortex rings and Newtons third law applied to plastic bottle rockets.

This educational hardware pack contains instructions for over 20 experiments, 5 water rockets, 5 vortex ring generators, 1 safe explosion/scoop, 1 x 2 litre jug, 1 ice cage, 5 chillisticks, 1 bubble mixture, 1 10 litre container, 5 sets of lightweight blue gloves, 1 instruction booklet. Dry ice is sold separately. Due to the characteristics of this product, delivery outside the UK is restricted. Please ring for details.

Direct Delivery – up to 2 weeks

E8R05359

kit **£63.95**

Supplied as 9mm food grade, dry ice pellets, shipped in polystyrene containers. Sufficient dry ice for experiments over 2 days, (10kg filled weight). Delivered Tuesday to Friday. **Important: When ordering please specify the day you require the ice delivered.** Due to the characteristics of this product, delivery outside the UK is restricted. Please ring for details.

Always handle dry ice with protective gloves or use a scoop.

Direct Delivery – up to 2 weeks

F8R05358

10kg **£55.95**

Chillstick have developed a unique dry ice storage system that allows you to keep small amounts of dry ice to hand. The Ice Pourer is a stainless steel canister with amazing insulation properties – it can hold dry ice for over three days! The ice pourer holds around 900g of dry ice. It is a fantastic way of having dry ice on hand and ensures dry ice can be poured without the need to touch the ice with your hand. Dry ice sold separately. Due to the characteristics of this product, delivery outside the UK is restricted. Please ring for details.

Direct Delivery – up to 2 weeks

E8R05360

each **£79.95**

Gloves, Leather see page 472
Safety Goggles see pages 473 to 475



A Principles of Gel Filtration Chromatography

Introduce chromatographic separation to your class and show them how dyes of different colours separate on the basis of their size and shape. This experiment contains materials for dye separation which include dye sample, elution buffer and plastic disposables. Columns may be rinsed and reused.

Kit includes: instructions, sample mixture, chromatography columns, dry matrix, elution buffer, transfer pipets, microtest tubes.

All you need: 50 or 100ml beakers, 25ml beaker or test tube and ring stands with clamps (see Glassware and Lab Equipment pages).

EBR03200

kit £119.95

B Ion Exchange Chromatography

Most molecules have a net charge within a pH range of 2 to 10. When the pH is altered, the net charge on molecules can change drastically. In this experiment, a mixture of two chemicals is absorbed onto a solid support ion-exchange column and separated during elution under conditions that influence their net charge.

Kit includes: instructions, ion exchanger, chemical mixture, potassium acetate buffer and chromatography columns.

All you need: spectrophotometer and cuvettes, ring stands and clamps, test tubes and 5ml pipettes and pumps.

EBR03202

kit £119.95

C Principles of Thin Layer Chromatography

This experiment introduces chromatographic theory and methods of thin layer chromatography. A mixture of dyes are separated on a cellulose-based TLC plate using two different solvent systems.

Kit includes: instructions, samples, reagents and solvents, cellulose thin layer plate, 5µl glass capillary pipets.

All you need: 250ml beakers, pipette pumps, 5 or 10ml pipettes (see Glassware and Lab Equipment).

EBR03201

kit £119.95



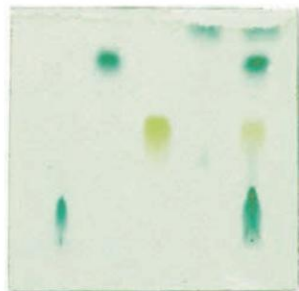
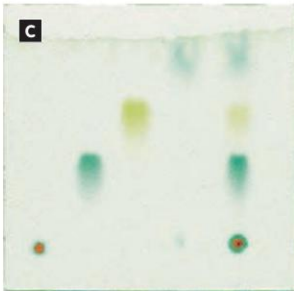
CURRICULUM LINKS

- The concept of a pure substance, diffusion, mixtures and dissolving
- Simple techniques for separating mixtures



CROSS REFERENCE

Simax® Beakers, Squat Form with Spout see page 433





A Simple Chromatography Kit

A basic set of equipment, designed to provide students with their first introduction to the principles of chromatographic separation using the ascending paper technique. A number of simple experiments are described in the accompanying leaflet, and a sample of mixed coloured inks is included for a rapid illustration of the process. Includes:

- Chromatography paper (100m roll in a ready to use width of 10mm).
- 20 Tubes and Caps
- 5 Spotting Pipettes
- 10 Glass Rods
- 10 Glass Clips
- Vial (5ml) of Mixed Inks

Direct Delivery – up to 10 days

E8L27935

each **£83.95**

B Chromatography Paper Roll, Grade 1

In 100m rolls.

	Width	roll
E8A57927	10mm	£21.95
E8A57939	20mm	£32.95
E8A57964	50mm	£54.95
E8A57976	100mm	£99.95
E8A57988	150mm	£118.95

Inks

Direct Delivery – up to 10 days

E8A37357	Brown	5ml £5.29
E8A37369	Royal Blue	5ml £5.29
E8A37370	Scarlet	5ml £5.29
E8A37382	Green	5ml £5.29
E8A37394	Blue/Black	5ml £5.29

C Chromatography Column 'Rotaflo'

High quality chromatography column with 'Rotaflo' stopcock and porosity 'O' sinter as standard with simple drip feed outlet. The interchangeable PTFE key requires no lubrication. The column is easily cleaned and requires little or no maintenance. Stopcock bore: 3mm. Outlet diameter: 8mm. Overall diameter: 20mm. Length: 300mm. Socket size: 19/26.

E8A58154

each **£105.95**

Chemicals for Chromatography and Electrophoresis

The following list of chemicals and reagents is based on requirements for the Philip Harris System of Chromatography. This listing of chemicals and reagents is applicable to other systems and provides the teacher with a convenient source for use as standards in analysis. Chemicals are supplied in 5ml vials.

Direct Delivery – up to 10 days

E8A37319	DL Aspartic Acid	5ml £4.79
E8A37321	DL Leucine	5ml £5.39
E8A37333	DL Lysine Monohydrochloride	5ml £5.29

Marker Mixture

Containing each of the above three amino acid solutions.

Direct Delivery – up to 10 days

E8A37345 set **£5.29**

D Chromatography Paper Sheets, Grade 1

Colours from sweets like Smarties or M&Ms or from water-based felt-tip pens split into their separate dyes when the chromatography paper absorbs water. Just how few dyes does it take to make all those sweet colours? Which was the pen that wrote the unsigned letter? Your children can be the detective! In boxes of 100 sheets. Size: 100 x 300mm.

E8A57999 box **£40.95**

E 'Polygram' Pre-Coated T.L.C. Plates

Coated with silica gel, average pore diameter 6mm, layer thickness, 0.25mm. With fluorescent indicator. A general purpose plate which can be used for most separations. Easily cut with scissors forming smaller plates which may be used to facilitate the further development of a given spot. The plates can also be rolled to fit into chromatography cylinders. When suitably coated with a fixative they may be punched for insertion into a ring binder. The carrier sheet is polyester, 0.2mm thick and is resistant to all organic solvents commonly used in T.L.C. In packs of 50.

Direct Delivery – up to 10 days

	Size	pack
E8A58051	40 x 80mm	£69.95
E8A58063	50 x 200mm	£119.95

Food Dyes

Set of seven (1g each of: E102 Tartrazine, E133 Brilliant Blue, E122 Carmoisine, E110 Sunset Yellow, E131 Patent Blue V, E142 Green S, E127 Erythrosine).

Direct Delivery – up to 10 days

E8A37461 set 7 **£27.95**



A BrainLinks Chemical Reactions

The linking card game that teaches you about Chemical Reactions. Players take turn to link the cards to their hand to those already played. However, if a link is not found, another card must be picked up! The first player to lay all their cards wins.

EBR05387 each **£4.79**

A Elementus™ Board Game

Elementus™ is a unique letter and word game based around the Periodic Table of Elements. Elements are the building blocks, not just of everything in the Universe, but also now of words! The game features 162 double-sided tiles, an Orion nebula board with word-start starting points, element tile racks, rules, a dice and a complete Periodic Table. The 162 tiles show a complete Periodic Table (plus some extra elements such as Oxygen (O), Thorium (Th), Einsteinium (Es) etc). Each tile shows the element's group in colour, name, atomic number and abbreviation. These tiles can be used to make word-nebulae on the board. If the element can't be used in a word the flip-side of the tiles shows a full A-Z of Dark Matter – all that stuff that scientists are still looking for but haven't quite found yet.

EBR05253 each **£39.95**

B Show-me Periodic Table Whiteboards

Unique Periodic Table Show-me Whiteboards. Pupils will learn both the location and symbol of the elements in the periodic table. An essential for every science classroom. Periodic table printed on one side, blank on the reverse. Comes complete with 10 x Show-me drywipe markers, mini foam erasers and a free Teachers Resource Booklet full of ideas and tips.

EBR05249 A4 pack 10 **£25.95**

EBR05248 A3 pack 5 **£32.95**

C Two In One Periodic Chart

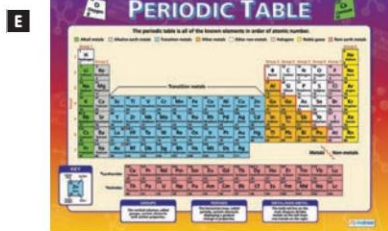
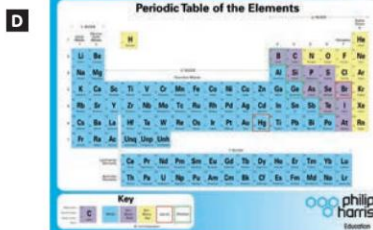
A laminated periodic chart showing the elements with their symbols, atomic numbers and relative atomic masses to the nearest whole number. The reverse is printed with a blank periodic grid which can be filled in as required using water based marker pens. Strengtheners are provided at both head and foot. Size: 700 x 695mm.

EBH68569 each **£27.95**

D Periodic Table

This wall chart is ideal for classroom walls and school hallways. The large A1 size makes the bright and informative chart highly readable from a distance, complementing every learning environment.

EBR04284 each **£13.95**



CURRICULUM LINKS

- The chemical and physical properties of elements
- The principles, periods and groups; metals and non-metals
- Reading the Periodic Table, predicting patterns in reactions

A



B



A Periodic Table Chart

This poster is a totally original collection that features gorgeous, never-before-seen photographic representations of the 118 elements in the periodic table - plus facts, figures and fascinating stories about each one! The elements are what we, and everything around us, are made of. But how many elements have you seen in their pure, raw, uncombined form? This poster provides that rare opportunity. Based on five years of research and photography, the pictures presented on this poster make up the most complete and visually arresting representation available to the naked eye of every atom in the universe. The large version of this poster comes as a double sided poster showing the elements in traditional picture form on one side and then in a data form on the reverse side.

EBR04270 20" x 40" (50cm x 100cm) each **£23.95**

EBR04289 27" x 53" (68cm x 134cm) each **£41.95**

B Periodic Table Cards

The front of each card shows a beautiful photograph of the element, while the back includes detailed scientific information and a description of the sample shown on the front. Laid out together the cards form a periodic table over 7.5 feet (2.3m) wide. Unique graphical representations of the melting point, boiling point, density and electron configuration allow you to create plots of these for properties for all the elements simply by sliding the deck to one side or another. For example, you can easily find the element with the highest density, or the lowest boiling point, by sliding the deck left or right.

These cards are perfect for classroom use. Each student can be given a card or group of cards to learn about, or notions of chemical affinity can be explored by trying out different arrangements of the periodic table.

EBR04271 set **£41.95**

C Mole Set

The mole set helps students visualise a mole in solid state. Contains four element specimens: Copper, Iron, Zinc and Aluminium. Each sample contains one mole, 6.02×10^{23} atoms of the element. This will help students develop a greater understanding of the concept of the mole, mass, molar mass, as well as a greater knowledge of the properties of each element when they compare these four specimens side by side.

EBR06007 pack **£47.95**

C



**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk

What is Micro-science?

Quite simply it is most aspects of traditional 'Macro Scale' practical science done on a micro scale, using equipment and techniques that mirror those used in industrial, clinical and forensic laboratories.

Micro-science is increasingly being adopted throughout the world as a method to deliver effective practical science in schools and universities and meet the challenge of growing difficulties with safety, time and cost. Many of the UK GCSE specifications refer to Micro-science investigations and there are many investigation examples to be found on the Royal Society of Chemistry website www.rsc.org.

Although featured here in our Chemistry section, Micro-science is also applicable to Physics and Biology investigations.

Why use Micro-science?

More efficient and effective

- More orderly learning environment (less moving around the room, no rush for limited apparatus, mainly seated during practical activities)
- Encourages good scientific attitudes (attention to detail, careful observation, working systematically)

Safety

- Safety is enhanced as much smaller quantities of chemicals are used or produced, greatly reduces risks
- Possibility of breakages / spillages greatly reduced, encouraging confidence and hands-on involvement
- Smaller quantities also reduce the chemicals that are disposed of at the end of lessons, reducing pollution

Time

- With Micro-science, investigations can be completed quickly giving more time for thinking about results and drawing conclusions and students can also retain more reliable data by gaining time to repeat observations

Motivation & Ownership

- The most important thing is that students enjoy using the Micro-science equipment
- Students enjoy performing their own tasks and generating their own data

A Micro-Chem Advanced Kit

The Micro-Chem Advanced Kit will perform a wide range of investigations over and over again. It is designed for both individual and group use. Some investigations that can be carried out are:

- Reduction of Copper Oxide
- The Zinc/Copper cell
- Compounds, elements, pure substances and mixtures
- Conductivity and pH of solutions of acids and bases
- Preparation of oxygen and hydrogen
- Preparation of iron (III) chloride
- Preparation of copper (II) chloride
- Organic chemistry: saturated and unsaturated hydrocarbons
- Extraction and purification of gold from its ore - an analogy using copper
- The reactions of sulphur with oxygen
- The reactions of a metal with oxygen
- Electrolysis of water

EBH69939

pack 10 £335.95

B Micro-Chem Basic Kit

The Micro-Chem Basic Kit is a good starter kit to experiment with some Micro-science techniques. Some of the investigations that can be carried out are:

- Chemical equilibrium
- Acid base chemistry
- Rates of reaction: OCR: C1a 5.16 Edexcel 11.4
- AQA 3.1.8, 3.1.9
- Stoichiometry
- Reaction of metals and their salt solutions C1a 5.15
- Enthalpy changes
- Reactivity of group 7 elements
- Industrial pollution
- Solubility of sulphates in water

The kit is robust and may be used repeatedly.

EBH71491

pack 10 £167.95

TO ORDER

Call

INT: +44 (0) 115 907 4001

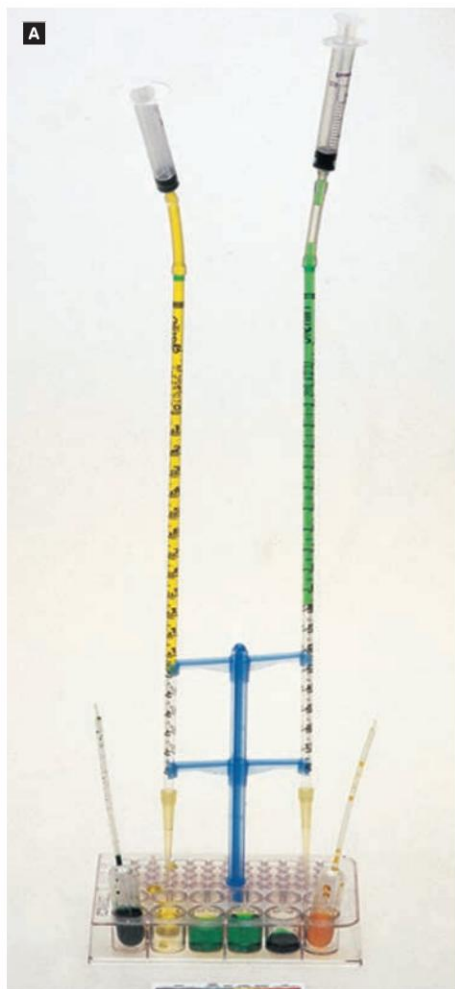
ROI: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROI: 01 427 3118





A Microtitration Kit

The Microtitration Kit makes titrations much easier and quicker to perform, while still maintaining the high degree of accuracy necessary for both GCSE and A-level analysis. Each kit contains: 1 comboplate, 1 spatula and forceps, 2 microstand cross arms, 2 microstand uprights, 1 pH guide, 2 pipettes 2mL, 8 microspatulas, 2 plastic tips, 2 silicone tubes, 2 syringes 2mL and 2 thin stemmed propettes.

E8H70668

kit £18.95

B Micro-Chemistry Combo Still

The Micro-Chemistry Combo Still is a unique, award winning product designed to carry out a wide range of distillation, refluxing and separation techniques. This kit can be used for demonstration, group work or individual experimentation. Examples of some of the applications are:

- Distillation of methylated spirits
 - Extraction of orange oil, oil of wintergreen, bromine water, unsaturated compounds
 - Chlorophyll experiments
- Key Stages: 3, 4 and 5
Curriculum Links:
- Edexcel: C1b 5.1 Extracting vegetable oils
 - Edexcel: C1b 7.15 Fractional distillation

E8H70644

each £77.95

C Clock Reaction Demonstration

Safely display the role of temperature and concentration on reactions. You'll mix one colourless solution with another and in a few seconds, the solution will suddenly turn dark blue. Increase the temperature of the solution, and the reaction occurs more rapidly. Dilute one of the solutions and the reaction occurs more slowly. This modified version of the typical clock reaction uses safer chemicals to demonstrate the impact of changing temperature and concentration upon the outcome of chemical processes.

E8R02645

kit £53.95

A Hoffmann's Voltmeter

For the demonstration of the chemical composition of water by volume and the electrochemical equivalent of hydrogen by electrolysis of water. Platinum electrodes mounted in rubber stoppers are used for the electrolysis of acidified water but carbon electrodes must be used for ammonia solutions or hydrochloric acid for any other chloride-containing solution. Stopcock and reservoir at apex of outer tubes and inner tube respectively.

Outer limbs graduated 50cm x 2cm. Overall height: 720mm, width: 87mm, reservoir capacity: 200cm. Supplied WITH/OUT clamps or stand. Supplied with platinum electrodes.

Direct Delivery – up to 4 weeks

E8A37096

each £89.95

B Electrodes, S-Type

Short S-type for hanging on side of 100cm beaker, carbon elements attached to stiff wire connectors with shrink-fit plastic insulation. Electrical connection by crocodile clips.

E8H25031

pair £22.95

C Electrolysis Cell

For quick and simple qualitative demonstration of electrolysis. Comprises stout open-ended glass tube fitted with two tapered carbon electrodes by means of a bored rubber stopper. Connections made by crocodile clips, and an insulating strip of plastic in the bung prevents the clips being shorted accidentally.

Glass tube: 74 x 24mm, length x external diameter.
Collecting tubes: 75 x 10mm, length x external diameter.
Rubber bung size: 21.

E8H25067

each £8.39

Platinum Electrodes

Mounted in rubber stopper, for use with the Hoffmann Voltmeter. Length: 84mm.

E8A37126

pair £46.95

D Carbon Electrodes

Carbon Electrodes mounted on a rubber stopper for use with the Hoffmann Voltmeter.

E8R05772

pair £8.39

E Carbon Rod

100mm rod to be used with Hoffmann's Voltmeter carbon electrodes.

E8A37242

pack 50 £49.95

F Pocket Magnifier

Lightweight magnifier with two plano-convex lenses. Lens mount folds into case. Dimensions: 15 x 25mm. 10X magnification.

E8R02332

each £2.49

G Plates for Simple Cells

90 x 25mm with a 4mm socket terminal. Plates are 1.5mm thick (carbon, 6mm).

E8H26965

Zinc

each £2.29

E8H26977

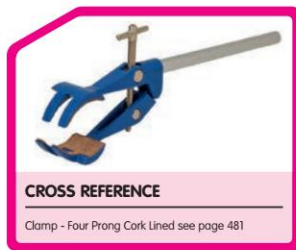
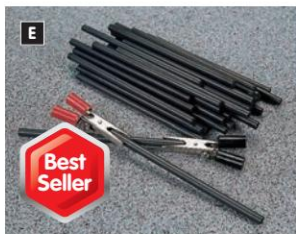
Carbon

each £1.99

E8H26989

Copper

each £3.99



A



B



C



D



A Gas Syringe

Precision ground, graduated glass syringe, gas tight and heat resistant. Outlet tube external diameter: 7mm. 100cm³.

E8A36171

each **£28.95**

B T-Tube

Glass, horizontal limb: 74mm, vertical limb: 35mm, external diameter: 7mm.

E8A36213

each **£2.89**

C Gas Tube, Graduated

Soda glass, sealed at one end. For collection and measurement of gases. Capacity: 50cm³ x 0.2cm.

E8A64189

each **£8.99**

D Absorption Tubes, Calcium Chloride, U-form with Side Arms

With side arms and strong walls, glass.

	Bore	Height	
E8A49852	14mm	125mm	each £3.89
E8A49864	17mm	150mm	each £4.79



CROSS REFERENCE

Red Rubber Stoppers - Solid
see page 482

A Pneumatic Trough, Circular, Polythene

One piece, dense white polythene trough, lighter than a comparable glass trough.
Unbreakable and corrosion resistant, withstanding 80°C continuously and 90°C for short periods. Diameter: 200mm, height: 100mm.

E8A78414

each £65.95

B Pneumatic Trough, Glass

Circular, clear glass with round top edge, flat bottom.

	Diameter	Height	each
E8A78396	300mm	125mm	£33.95

C Gas Jar, Cylindrical

Clear glass, with heavy foot and ground flange. Supplied WITHOUT cover.

Sizes given are approximate.

	Height	Internal Diameter	each
E8A64105	200mm	50mm	£7.19
E8A64117	200mm	60mm	£13.95
E8A64130	300mm	60mm	£14.95

Gas Jar Cover

Circular, sheet glass, ground on one side. Supplied in packs of 10. May contain mixed plain glass and ground glass lids; this should not present any problems in normal use.

	Diameter	pack 10
E8A64142	65mm	£1.89
E8A64154	75mm	£1.56

D Beehive Shelf

Stoneware, for use in pneumatic troughs for gas collection; glazed inside and out. Diameter: 100mm.

E8A55256

each £4.39

E Philip Harris Simple Gas Preparation Kit

A small scale gas preparation kit for producing gases which can be collected over water, e.g. oxygen, hydrogen and carbon dioxide.

The kit comprises of:

- Plastic tank with lid
- Test tube stand
- Five test tubes 150 x 24mm and stoppers
- Thistle funnel
- Test tube with side arm and one-hole stopper
- Special glass chimney shelf
- Delivery tube and tubing connector
- The tank and lid form a storage box for all components
- Complete with instructions

E8A36122

each £57.95

**TO ORDER**

Call

INT: +44 (0) 115 907 4001

ROI: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROI: 01 427 3118

A

**A Quickfit Microscale Chemistry Kit**

The Quickfit Microscale Chemistry Kit is perfect for experiments with milligram quantities of reagent. It features many products currently offered in standard size Quickfit sets but on a much smaller scale. Most standard organic chemistry techniques may be performed using the Microscale Kit. The kit provides significant benefits:

Cheaper

By reducing the scale of organic reactions you automatically reduce the cost of everything involved.

Safer

Using smaller amounts of organic reagents and chemicals makes handling safer. The kit is designed to be used with hot plates and a sandbath, with no bunsen burners present - eliminating the risk of igniting highly flammable liquids.

Quicker

Can be safely and securely assembled much quicker than the standard kits, saving valuable time. Boiling and cooling times are also vastly reduced. The screwthread connector system also eliminates the need for grease/lubricant to be applied to the Quickfit joint resulting in contamination free reactions. The efficient methods of connection saves on space, and with no need for clamps the danger of glassware becoming loose during experiments is greatly reduced.

Versatile

Many assemblies can be constructed from the glassware including reflux, distillation, moisture sensitive reactions and fractional distillation. Complete with a range of reaction and collecting vessels the Quickfit Microscale Kit provides a versatile approach to standard laboratory procedures.

Easy to Assemble

All components use a combination of standard Quickfit ground glass joints together with screwthread couplings, sealing 'O' rings and plastic screw caps.

The Quickfit Microscale Chemistry Kit is presented in a sturdy Grinnell tray with protective foam insert. Kit comprises:

- Air condenser
- Jacketed condenser
- Drying tube
- Still head
- Thermometer adapter
- Receiver
- 10mL Erlenmeyer flask
- 25mL Erlenmeyer flask
- 10mL Round Bottom flask
- 25mL Round bottom flask
- 10mL Pear shaped flask
- 25mL Pear shaped flask
- Bag of accessories including 5 x plastic caps, 5 x 'O' rings, 5 x sealing discs and 1 x thermometer accessories

EBR05278each **£203.95****B Quickfit 25mL Dropping Funnel**

This Quickfit Microscale Dropping Funnel is the latest addition to the popular Quickfit Microscale Chemistry Kit.

With a nominal 25mL capacity the dropping funnel can be utilised for addition reactions or as a separating funnel to perform liquid-liquid extractions. The PTFE stopcock has a 2mm bore which provides excellent control when reagents need to be added slowly or drop-wise to prevent side reactions.

- Manufactured to the same high standard as the Microscale Kit with the reassuring quality of Quickfit ground glass joints and Pyrex borosilicate glass
- Interchangeable PTFE stopcock for smooth, grease free performance
- Screwthread connector system eliminates the need for lubricants and requires fewer clamps

EBR05279each **£53.95**

B



A Quickfit Set (27BU/M 14/23 Joints)

For preparative chemistry up to advanced level. This set enables a number of preparations to be carried out on the 30g scale. Contents:

- Pear shaped flask, 50cm³
- Still head
- Liebig condenser
- Screwcap adaptor
- Receiver adaptor
- Thermometer, 0 - 360°C x 2°C
- Dropping funnel, 50cm³ with Rotaflo tap
- Stopper
- Air leak/steam inlet tube

E8A36249

set £191.95

B Quickfit Distillation Apparatus

Three jointed glass pieces in one to form the distillation apparatus. The angles are pre-defined and it will require fewer clamps, making it more secure to assemble. This apparatus will make distillation experiments easier to set up.

- Cone size: 19/26
- Socket size: 14/23
- Effective condenser length: 155mm
- Overall Dimensions: 330 x 210 x 30mm

E8H03394

each £106.95

Practical Information

INTERCHANGEABLE ORGANIC CHEMISTRY GLASSWARE

Preparative and analytical glassware using interchangeable ground glass joints. The glassware listed is made from borosilicate glass of low alkali content, rendering it highly resistant to attack by water and all acids except hydrofluoric and phosphoric(V) acids.

Joint size: The size designation, e.g. 14/23 indicates a joint of nominal diameter 14mm at the wide end with a nominal length of engagement of 23mm.

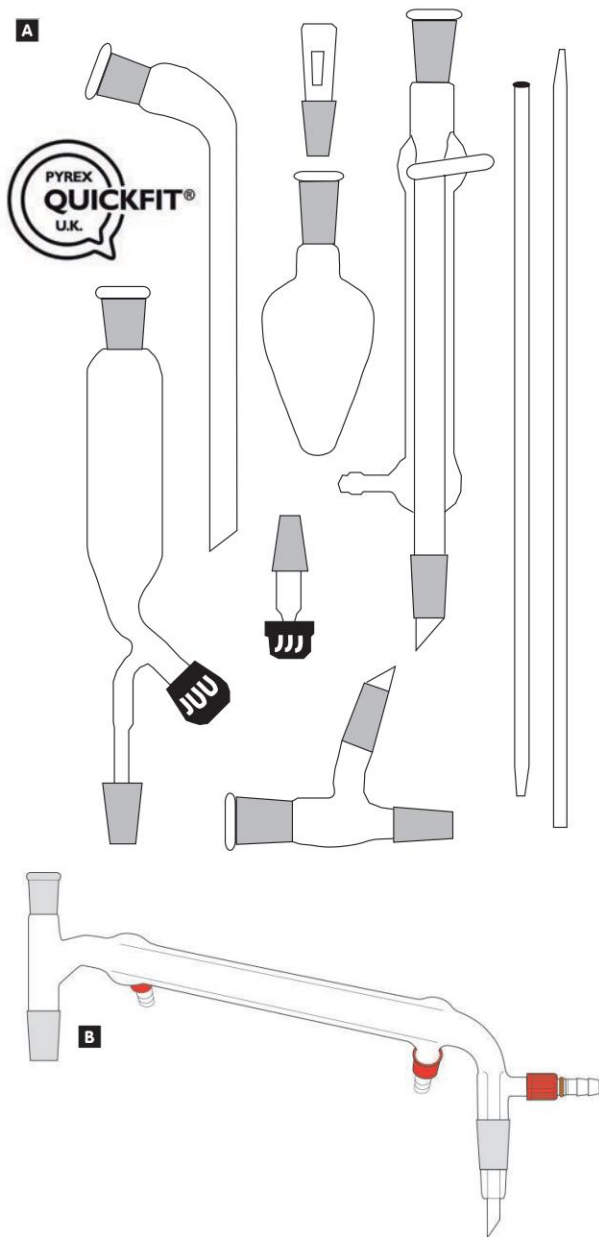
Socket: This is the part of the joint which is ground on the inside.

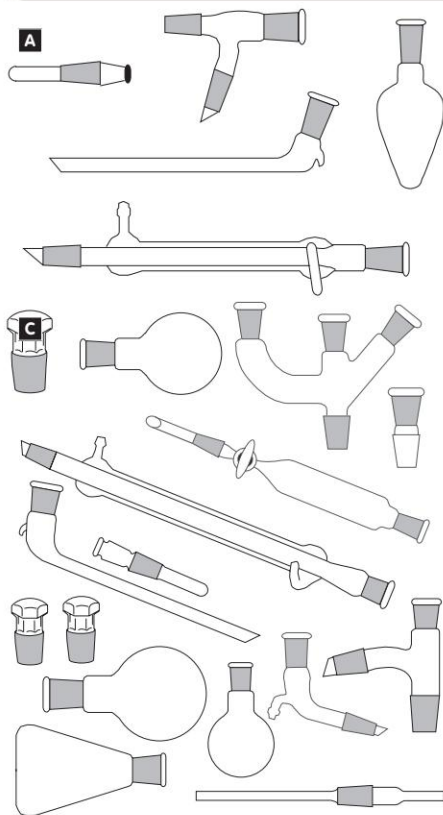
Cone: This is the part of the joint which is ground on the outside.

Care and Maintenance of Quickfit Joints:

- Always wear protective clothing e.g. goggles, gloves and lab coat.
 - Always examine glassware prior to use. Do not use if glassware is chipped, cracked or etched.
 - Wash or soak glassware promptly after use to avoid hard, dried residues. If a brush is used, take care not to scratch the glass.
 - Lubricate joints with a laboratory grease to prevent seizure. Alternatively use PTFE tape or joint sleeves.
- If joints do seize then the following procedures can be considered:

- Always wear protective gloves and a face mask.
- Carefully rock the cone in its socket.
- Consider the use of penetrating oil.
- Warm the socket, not the cone, under a running stream of hot water from the tap. (Only if no volatile liquids are contained).
- If using a Bunsen burner for heating employ a soft flame and use a gauze to prevent localised heating.
- Always cool glassware slowly and avoid draughts to prevent thermal shock.
- The glassware is highly resistant to chemical attack, however do not use hydrofluoric acid, hot phosphoric acid and strong hot alkalis.
- Do not leave ground glass joints in contact with caustic alkalis for long periods of time. Its attack on the matt surface is quite rapid and if left between two ground surfaces it cements them together very effectively.





A Philip Harris Set 1 (14/23 Joints)

Basic set for simple preparations in a first course of organic chemistry.

Contents

- 1 Liebig condenser
- 1 Receiver adaptor
- 1 Pear shaped flask, 50cm³
- 1 Stillhead
- 1 Thermometer pocket

E8A36479

set £76.95

B Philip Harris Set 2

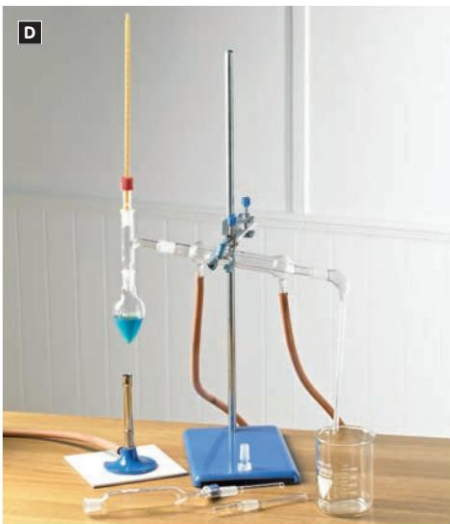
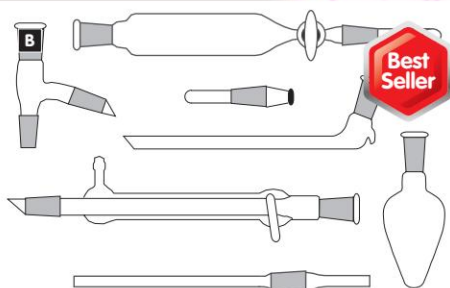
This set covers more fully the requirements of any school where preparative organic chemistry is taught. Experiments requiring an air leak-steam inlet tube may be performed with this kit.

Contents:

- 1 Air leak-steam inlet tube
- 1 Funnel, 50cm
- 1 Stopper
- 1 Liebig condenser
- 1 Pear shaped flask, 50cm³
- 1 Stillhead
- 1 Thermometer pocket

E8A36481

set £118.95



C Organic Project Set 7

For preparations on the 150g scale. Contains all the equipment a student is likely to require for project work in preparative organic chemistry. The quantities of chemicals which can be used in the laboratory together with the variety of components allow industrial processes to be simulated.

Contents:

- Liebig condenser, socket 19/26, cone 19/26
- Air leak tube, cone 19/26
- Receiver adaptor, socket 19/26, cone 24/29
- Cylindrical funnel, 100cm³, socket 19/26, cone 19/26
- Flask, R.B., 50cm³, socket 24/29
- Flask, R.B., 100cm³, socket 24/29
- Flask, R.B., 250cm³, socket 24/29
- Reduction adaptor, socket 19/26, cone 24/29
- Multiple adaptor, socket 19/26, cone 24/29
- Receiver adaptor bent, socket 19/26
- Stillhead, socket 14/23, cone 19/26
- Flask, Erlenmeyer, 250cm³, socket 24/29
- Thermometer pocket, cone 14/23
- Stopper, cone 19/26 (x2)
- Stopper, cone 24/29

E8A36509

set £317.95

D Jointed Glassware Set

Glassco borosilicate glass set for preparative chemistry up to A Level. This set enables a number of preparations to be carried out on a 30g scale.

Set consists of:

- Still head, socket 14/23, cone 14/23
- Condenser, socket 14/23, cone 14/23
- Receiver adaptor, plain bends, long, socket 14/23, cone 14/23
- Thermometer pocket, socket 14/23, cone 14/23
- Dropping funnel, socket 14/23, cone 14/23
- Stopper, 14/23
- Tubes/air inlets, straight with cone 14/23
- Thermometer -10 to 250°C

E8R05224

set £100.95



A Quickfit Conical Flask

Conical flask with ground socket.

	Capacity	Socket size
E8R04509	100mL	14/23

each **£16.95**

B Quickfit Round Bottom, Short Neck Flask

Round bottom flask.

	Capacity	Socket size
E8A36328	25mL	14/23
E8R04506	50mL	14/23
E8R04507	100mL	14/23
E8R04508	250mL	14/23

each **£12.95**

each **£12.95**

each **£15.95**

each **£17.95**

C Quickfit Pear Shaped Flask

Highest quality Quickfit ground glass socket. Ideal for semi-micro distillations. Pear shaped design allows distillation down to a small bulk which will reduce losses from thermal decomposition. Borosilicate glass for chemical resistance and thermal performance.

	Capacity	Socket size	
E8A36304	50mL	14/23	each £12.95
E8R04505	100mL	14/23	each £15.95

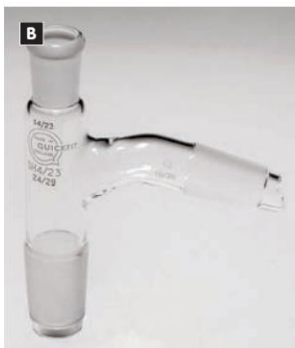
D Quickfit Pear Shaped Flask with Two Necks

Centre neck and one angled side neck.

Direct Delivery – up to 8 weeks

	Capacity	Side socket	Centre socket	
E8A36316	50mL	14/23	14/23	each £36.95

Images may show different sizes from the description



A Quickfit Multiple with 2 Necks

Borosilicate glass for chemical resistance and thermal performance. Two necks, one vertical and one angled at 45°.

	Cone size	Socket size	
E8R04504	19/26	19/26	each £38.95

B Quickfit Still Head

Angled for connecting to a condenser or similar device. Cone size to fit condenser 14/23.

	Cone size	Socket size	
E8A36339	14/23	14/23	each £25.95

C Quickfit Fractionating Column

Vigreux type with combination of horizontal and angled indentations. Horizontal indentations ensure intimate vapour and liquid contact. Length 360mm.

	Cone size	Socket size	
E8A36572	24/29	24/29	each £82.95

D Quickfit Thermometer Pocket

For incorporating thermometers into Quickfit jointed-ware assemblies. Pocket fits most Quickfit still heads.

	Length	Cone size	
E8R04510	45mm	14/23	each £25.95

E Quickfit Liebig Condenser

Popular water-jacketed condenser suitable for distillation and reflux applications. Detachable plastic screwthread connectors for easy and safe attachment of rubber hose. Approx. effective length 155mm. Approx. overall length 260mm.

	Cone size	Socket size	
E8R04511	14/23	14/23	each £34.95
E8R06008	19/26	19/26	each £28.95



CROSS REFERENCE

Red Spirit Filled Thermometer - Total Immersion
see page 417

TO ORDER

Call

INT: **+44 (0) 115 907 4001**
ROI: **01 427 3100**

Fax

INT: **+44 (0) 115 907 4002**
ROI: **01 427 3118**



A Quickfit Adaptor Stillhead Recovery

Provides a simple vapour conduit between flasks and distillation condensers.

Cone size Socket size

E8R04512 14/23 14/23 each **£18.95**



B Quickfit Adaptor Reduction

Small sized socket at the top, large sized cone at the bottom.

Cone size Socket size

E8R04514 24/29 14/23 each **£12.95**

E8R04515 24/29 19/26 each **£12.95**



C Quickfit Dropping Funnel Stem with Cone

Funnel system with ground-glass cone for easy incorporation into Quickfit flasks and assemblies. Stopcock has interchangeable glass key.

Cone size Socket size

E8R04513 14/23 14/23 each **£69.95**



D Quickfit Adaptor Expansion

Useful for connection of dissimilar sized ground glass joints. Large sized socket at the top and small sized cone at the base.

Cone size Socket size

E8R04516 14/23 19/26 each **£12.95**

E8R04517 14/23 24/29 each **£17.95**



E Quickfit Adaptor Cone-Screwthread

Screwthread joint complete with plastic cap, silicone rubber ring and PTFE washer. Ideal for securing thermometers and gas inlet tubes.

Cone size Thread size

E8R04518 14/23 13 each **£18.95**

E8R04519 14/23 18 each **£18.95**



F Quickfit Receiver Adaptor

Useful for feeding distillate from condensers into receiving vessels.

Length Socket size

E8A36353 190mm 14/23 each **£18.95**

E8R04521 65mm 14/23 each **£19.95**

E8R04522 65mm 19/26 each **£19.95**



G Quickfit Stopper

Borosilicate glass with side indentations to provide finger grip.

Cone size

E8A36377 14/23 each **£4.39**



H Quickfit Joint Clips Conical Joints

For retaining glassware having Quickfit conical joints. Manufactured from polyacetal. Can considerably reduce the need for clamping. Easy to fit and remove. Can be used at temperatures up to 80°C. Clips are colour coded for easy identification.

Cone size

Yellow
E8R04524 14/23 pack 10 **£31.95**

Blue
E8R04525 19/26 pack 10 **£31.95**

Green
E8R04526 24/29 pack 10 **£31.95**





A Conical Flask

Borosilicate glass. Capacity 250mL.
Socket size

E8A36649 19/26 each £8.09

B Boiling Flask - Short Neck

Boiling flask with short neck. Borosilicate glass.

Direct Delivery - up to 4 weeks

Capacity	Socket size	each
E8A36675 100mL	14/23	£7.39
E8A36687 100mL	24/29	£8.69
E8A36705 250mL	24/29	£9.95
E8L77392 1000mL	24/29	£18.95

C Pear-Shaped Flask - Single Neck

Single neck pear shaped flask. Borosilicate glass.

Direct Delivery - up to 4 weeks

Capacity	Socket size	each
E8A36754 100mL	14/23	£9.49

D Buchner, Filter Flask

Buchner filter flask with socket. Borosilicate glass.

Direct Delivery - up to 4 weeks

Capacity	Socket size	each
E8A36789 100mL	19/26	£19.95

E Plain Stillhead

With socket for thermometer sleeve and matching cones for flask and condenser. Borosilicate glass.

Cone size	Socket size	each
E8A36959 14/23	14/23	£13.95

F Filter Pump

Made of polypropylene, fully demountable for easy cleaning.

E8R06066 each £10.95



A Liebig Condenser 19/26

Fitted with 13mm screwthread connectors. Borosilicate glass. Effective length: 400mm (not including sockets).

	Cone size	Socket size
E8A36559	19/26	19/26

each **£21.95**

B Plain Bends (Long)

Jointed bends, borosilicate glass.

	Socket size
E8A36936	14/23

each **£7.49**



Direct Delivery

Great Value



C Stoppers

Stopper for cone. Both ends closed. Borosilicate glass.

Direct Delivery – up to 4 weeks

	Cone size
E8R01604	14/23
E8A36833	19/26

D Liebig Condenser

Borosilicate glass 150mm.

	Cone size	Socket size
E8R01606	14/23	14/23

E Air Leak Tubes

Air leak tubes with cone.

	Socket size
E8A36819	14/23

each **£15.99**

each **£5.99**



F Reduction Adaptors

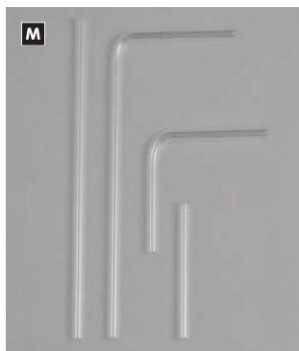
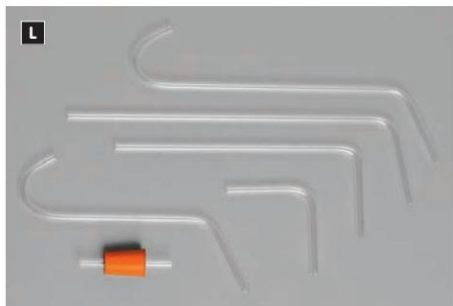
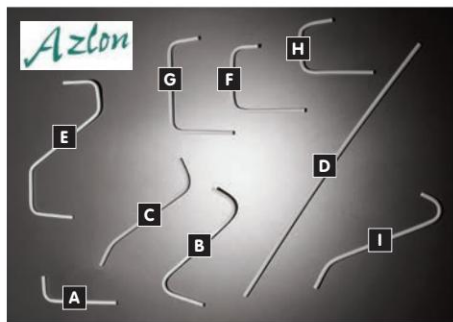
Reduction adaptor for socket. Borosilicate glass.

	Cone size	Socket size	
E8A36857	19/26	14/23	each £5.49

G Expansion Adaptors

Expansion adaptor with socket. Borosilicate glass.

	Cone size	Socket size	
E8A36912	19/26	24/29	each £6.89



Azlon Gas Delivery Tubes

Gas delivery tubes, polypropylene. Pre-bent rigid polypropylene delivery tubes. Unbreakable in normal use - ideal substitutes for fragile glass alternatives. Suitable for many types of gas collection experiments in schools and universities. Tube I.D. 4mm / O.D. 6mm.

A 90 Degree

E8R04527

B Bung Top

E8R04528

C Side Arm

E8R04529

D Straight Tube

E8R04530

E Double Bend

E8R04531

F U Bend

E8R04532

G Large U Bend

E8R04533

H Small U Bend

E8R04534

I Arm U Bend

E8R04535

J Combustion Tubes

Borosilicate glass, open both ends. For oxidation and reduction of chemical substances. Length: 300mm.

	O.D.	Bore	
E8A89096	17mm	11mm	each £3.59
E8A89102	22mm	17mm	each £4.49

K Combustion/Ignition Tube

Borosilicate glass. For the reduction of metal oxides with hydrogen. A small hole in the side of the lower end of the tube allows for escape of gas. Dimensions: L150 x 25mm diameter.

E8A89138	each £3.39
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L Delivery Tubes

Soda glass. Outside diameter: 6mm. Set of six.

E8A89149	set £9.69
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M Delivery Tubes

Soda glass. Outside diameter: 6mm. Set of four comprising:

• 1 x short, straight, 70mm length	
• 1 x long, straight, 170mm length	
• 1 x 90° bend, arms 60mm and 160mm lengths	
• 1 x 90° bend, arms 60mm long	
E8A89151	set £6.89

N Glass Sample Tube

Clear glass straight side, flat bottom with polythene plug.

	Height	Diameter	
E8A89217	50mm	25mm	pack 10 £6.19
E8A89229	75mm	25mm	pack 10 £8.59
pack 5	£18.95		

Our Chemicals

- ✓ Wide range of chemicals
- ✓ Packed safely for your country's requirements
- ✓ UN approved packaged
- ✓ Labelled with appropriate hazard warnings

Helpful Information

- ✓ SDS are available for easy download
- ✓ Full technical support
- ✓ Advice on storage available



As chemicals are packed and shipped separately from any other products ordered from Philip Harris, they will be subject to their own carriage charge. You will be informed of this charge at the point of order. See terms and conditions for details.

Special Transport

Several chemicals in our range fall into the most hazardous category for transport and may only be carried by specially trained drivers. This has forced us to place a Carriage Surcharge (applied to the consignment, not the individual material) on these particular chemicals.

Non-UK Mainland Customers (Including Northern Ireland and UK 'Island' areas)

All orders to these areas will be subject to additional charges, to cover the additional costs of shipping and packaging required to comply with prevailing legislation on the transport of dangerous goods.

Security

At Philip Harris we recognise that chemicals represent a major hazard for schools and act responsibly to reduce the risk they represent.

We only use UN approved packaging, with the appropriate hazard warnings and delivery note clearly visible on the outside. So when chemicals arrive at a school it is clear what they are, helping staff to deal with them promptly and safely.

For the latest SDS sheets, please see www.philipharris.co.uk and download from chem portal or email techsupport@philipharris.co.uk.

Purity and molarity

Some chemicals, irrespective of grade, contain additives such as an anti-caking agent. This has no appreciable effect on the chemical behaviour of the substance, but does affect the amount that must be weighed out to achieve solutions of accurate molarity. E.g. copper sulfate-5-water is 98% pure, so a 1M solution requires $249.68 \div 0.98 = 254.78\text{g}$ to be dissolved in 1 litre. Allow to settle or filter to remove any insoluble component.

Please read all of the following points carefully before placing your chemicals order.

Chemicals

Chemicals are subject to growing and constantly changing legislation governing all areas including supply, use, storage and disposal. Failure to comply with this legislation can result in serious legal proceedings and penalties, and places additional obligations on you as the purchaser and Philip Harris (and our agents) as the supplier. Due to prevailing legislation and security considerations, chemicals cannot be supplied to private individuals.

Points on ordering chemicals

- Many chemicals have a limited shelf life
- Please do not order more chemicals than you require
- Disposal of unwanted or excess chemicals is covered by extensive legislation and has become a specialized business (see opposite)

CLP Regulation No 1272/2008	Example of Hazard Statement	Example of Precautionary Statement
GHS02 	Heating may cause a fire	Keep only in original container
GHS03 	May intensify fire; oxidiser	Take any precaution to avoid mixing with combustibles
GHS05 	Corrosive to metals and skin; Causes serious eye damage	Wear eye protection
GHS06 	Toxic if swallowed	Do not eat, drink or smoke when using this product
GHS07 	May cause an allergic skin reaction	Contaminated work clothing should not be allowed out of the workplace
GHS08 	May cause allergy or asthma symptoms or breathing difficulties if inhaled	In case of inadequate ventilation wear respiratory protection
GHS09 	May cause allergy or asthma symptoms or breathing difficulties if inhaled	In case of inadequate ventilation wear respiratory protection

For more information on CLP regulations, please refer to: www.cleapss.org.uk

Trusted by science educators around the world!

Hazard class	Category	Pictogram	Signal word	Code	Hazard statements	P-Codes
Explosives	Unstable Explosive	 GSH01	Danger	H200	Unstable Explosive	P201, P202, P281, P372, P373, P380, P401, P501
	Div 1.1		Danger	H201	Explosive; mass explosion hazard	P210, P230, P240, P250, P280 P370+P380, P372, P373, P401, P501
	Div 1.2		Danger	H202	Explosive; severe projection hazard	P210, P230, P240, P250, P280, P370+P380, P372, P373, P401, P501
	Div 1.3		Danger	H203	Explosive; fire, blast or projection hazard	P210, P230, P240, P250, P280, P370+P380, P372, P373, P401, P501
	Div 1.4		Warning	H204	Fire or projection hazard	P210, P240, P250, P280, P370+P380, P372, P373, P374, P401, P501
	Div 1.5	No Pictogram	Danger	H205	May mass explode in fire	P210, P230, P240, P250, P280, P370+P380, P372, P373, P401, P501
	Div 1.6	No Pictogram				
Flammable gases	Category 1	 GSH02	Danger	H220	Extremely flammable gas	P210, P377, P381, P403
	Category 2	No Pictogram	Warning	H221	Flammable gas	P210, P377, P381, P403
Flammable aerosols	Category 1	 GSH02	Danger	H222	Extremely flammable aerosol	P210, P211, P251, P410+P412
	Category 2		Warning	H223	flammable aerosol	P210, P211, P251, P410+P412
Flammable liquids	Category 1	 GSH02	Danger	H224	Extremely flammable liquid and vapour	P210, P233, P240, P241, P242, P243, P280, P303+P361+P353, P370+P378, P403+P235, P501
	Category 2		Danger	H225	Highly flammable liquid and vapour	
	Category 3		Warning	H226	Flammable liquid and vapour	
Flammable solids	Category 1	No Pictogram	Danger	H228	Flammable solid	P210, P240, P241, P280, P370+P378
	Category 2		Warning	H228		
Self-reactive substances and organic peroxides	Type A	 GSH01	Danger	H240	Heating may cause an explosion	P210, P220, P234, P280, P370+P378, P370+P380+P375, P403+P235, P411, P420, P501
	Type B	 GSH01 GSH02	Danger	H241	Heating may cause a fire or explosion	P210, P220, P234, P280, P370+P378, P370+P380+P375, P403+P235, P411, P420, P501
	Type C, D	 GSH02	Danger	H242	Heating may cause a fire	P210, P220, P234, P280, P370+P378, P403+P235, P411, P420, P501
	Type E, F		Warning	H242	Heating may cause a fire	P210, P220, P234, P280, P370+P378, P403+P235, P411, P420, P501
	Type G		No Pictogram			
Pyrophoric liquids Pyrophoric solids	Category 1	 GSH02	Danger	H250	Catches fire spontaneously if exposed to air	P210, P222, P280, P302+P334, P370+P378, P422
Self-heating substances and mixtures	Category 1		Danger	H251	Self-heating; may catch fire	P235+P410, P280, P407, P413, P420
	Category 2		Warning	H252	Self-heating in large quantities; may catch fire	
Substances and Mixtures which, in contact with water, emit flammable gases	Category 1	 GSH02	Danger	H260	In contact with water releases flammable gases which may ignite spontaneously	P223, P231+P232, P280, P335+P334, P370+P378, P402+P404, P501
	Category 2		Danger	H261	In contact with water releases flammable gas	
	Category 3		Warning	H261	In contact with water releases flammable gas	
Oxidising gases	Category 1	 GSH03	Danger	H270	May cause or intensify fire; oxidizer	P220, P244, P370+P376, P403
Oxidising liquids; Oxidising solids	Category 1		Danger	H271	May cause fire or explosion; strong oxidiser	P210, P220, P221, P280, P283, P306+P360, P371+P380+P375, P370+P378, P501
	Category 2		Danger	H272	May intensify fire; oxidizer	P210, P220, P221, P280, P370+P378, P501
	Category 3		Warning	H272	May intensify fire; oxidizer	
Gases under pressure	Compressed gas Liquefied gas Dissolved gas	 GSH04	Warning	H280	Contains gas under pressure; may explode if heated	P282, P336, P315, P403
	Refrigerated liquefied gas		Warning	H281	Contains refrigerated gas may cause cryogenic burns or injury	
Corrosive to metals	Category 1	 GSH05	Warning	H290	May be corrosive to metals	P234, P390, P404
Acute toxicity, oral	Category 1, 2	 GSH06	Danger	H300	Fatal if swallowed	P264, P270, P301+P310, P321, P330, P405, P501
	Category 3		Danger	H301	Toxic if swallowed	P264, P270, P301+P310, P321, P330, P405, P501
	Category 4	 GSH07	Warning	H302	Harmful if swallowed	P264, P270, P301+P312, P330, P501

Hazard class	Category	Pictogram	Signal word	Code	Hazard statements	P-Codes
Aspiration hazard	Category 1		Danger	H304	May be fatal if swallowed and enters airways	P301+P310, P331, P405, P501
Acute toxicity, dermal	Category 1, 2		Danger	H310	Fatal in contact with skin	P262, P264, P270, P280, P302+P352, P310, P322, P361, P363, P405, P501
	Category 3	GS-H06	Danger	H311	Toxic in contact with skin	P280, P302+P352, P312, P322, P361, P363, P405, P501
	Category 4		Warning	H312	Harmful in contact with skin	P280, P302+P352, P312, P322, P363, P501
Skin corrosion/irritation	Category 1A, B, C		Danger	H314	Causes severe skin burns and eye damage	P260, P264, P280, P301+P330+P331, P303+P361+P353, P363, P304+P340, P310, P321, P305+P351+P338, P405, P501
	Category 2		Warning	H315	Causes skin irritation	P264, P280, P302+P352, P321, P332+P313, P362
Sensitisation, skin	Category 1		Warning	H317	May cause an allergic skin reaction	P261, P272, P280, P302+P352, P333+P313, P321, P363, P501
Serious eye damage/eye irritation	Category 1		Danger	H318	Causes serious eye damage	P280, P305+P351+P338, P310
	Category 2		Warning	H319	Causes serious eye irritation	P264, P280, P305+P351+P338, P337+P313
Acute toxicity inhalation	Category 1, 2		Danger	H330	Fatal if inhaled	P260, P271, P284, P304+P340, P310, P320, P403+P233, P405, P501
	Category 3	GS-H06	Danger	H331	Toxic if inhaled	P261, P271, P304+P340, P311, P321, P403+P233, P405, P501
	Category 4		Warning	H332	Harmful if inhaled	P261, P271, P304+P340, P312
Sensitisation, respiratory	Category 1		Danger	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled	P261, P285, P304+P341, P342+P311, P501
Specific target organ toxicity, single exposure; Respiratory tract irritation	Category 3		Warning	H335	May cause respiratory irritation	P261, P271, P304+P340, P312, P403+P233, P405, P501
Specific target organ toxicity, single exposure; Narcotic effects	Category 3	GS-H07	Warning	H336	May cause drowsiness or dizziness	
Germ cell mutagenicity	Category 1A, 1B		Danger	H340	May cause genetic defects	P201, P202, P281, P308+P313, P405, P501
	Category 2	GS-H08	Warning	H341	Suspected of causing genetic defects	
Carcinogenicity	Category 1A, 1B		Danger	H350	May cause cancer	P201, P202, P281, P308+P313, P405, P501
	Category 2	GS-H08	Warning	H351	Suspected of causing cancer	
Reproductive toxicity	Category 1A, 1B		Danger	H360	May damage fertility or the unborn child	P201, P202, P281, P308+P313, P405, P501
	Category 2	GS-H08	Warning	H361	Suspected of damaging fertility or the unborn child	
Reproductive toxicity, effects on or via lactation	Additional category	No Pictogram		H362	May cause harm to breast-fed children	P201, P260, P263, P264, P270, P308+P313
Specific target organ toxicity, single exposure	Category 1		Danger	H370	Causes damage to organs	P260, P264, P270, P307+P311, P321, P405, P501
	Category 2	GS-H08	Warning	H371	May cause damage to organs	P260, P264, P270, P309+P311, P405, P501
Specific target organ toxicity, repeated exposure	Category 1		Danger	H372	Causes damage to organs through prolonged or repeated exposure	P260, P264, P270, P314, P501
	Category 2	GS-H08	Warning	H373		
Hazardous to the aquatic environment, acute hazard	Category 1		Warning	H400	Very toxic to aquatic life	P273, P391, P501
Hazardous to the aquatic environment, long-term hazard	Category 1		Warning	H410	Very toxic to aquatic life with long lasting effects	P273, P391, P501
	Category 2	GS-H09		H411	Toxic to aquatic life with long lasting effects	
	Category 3	No Pictogram		H412	Harmful to aquatic life with long lasting effects	P273, P501
	Category 4	No Pictogram		H413	May cause long lasting harmful effects to aquatic life	

Acetamide

Alternative Description: Ethanamide
Formula: CH_3CONH_2
M.W. 59.07
CAS No: 60-35-5
EEC No: 200-473-5

Warning:
Hazard: H351
Precaution: P281

EBA65456

100g £13.95

EBA65468

250g £24.95

Acetic acid**Acetic acid 1.0M**

Alternative Description: Ethanoic acid 1M solution
Formula: CH_3COOH
M.W. 60.05

EBA65511

2.5L £11.95

Acetic acid 2.0M

Alternative Description: Ethanoic acid 2M solution
Formula: CH_3COOH

Warning:
Hazard: H315, H319
Precaution: P305+P351+P338

EBA65509

2.5L £7.39

Acetic acid glacial

Alternative Description: Ethanoic acid
Formula: CH_3COOH
Flash Point: 50°C
CAS No: 64-19-7
EEC No: 200-580-7
Danger
Hazard: H226, H314
Precaution: P280, P305+P351+P338, P310

Acetic acid glacial

E8F75513

500mL £6.09

E8R04066

6 x 1L £46.95

Acetic acid glacial AR

E8F75537

500mL £6.79

Acetic anhydride

Alternative Description: Ethanoic anhydride
Formula: $(\text{CH}_3\text{CO})_2\text{O}$
M.W. 102.09
Flash Point: 49°C
CAS No: 108-24-7
EEC No: 203-564-8
Danger

Hazard: H314, H226, H302, H332
Precaution: P280, P305+P351+P338, P310

EBA65523

100mL £6.49

E8R04068

500mL £9.95

Acetone

See Propanone

Acetyl chloride

See Ethanoyl chloride

Acid blue 40

EBA65547

5g £9.79

Agar powder

CAS No: 9002-18-0
EEC No: 232-658-1

E8A65560

100g £10.95

E8A65572

250g £24.95

E8L77513

500g £82.95

L-Alanine

Alternative Description: 2-Aminopropanoic acid

E8A65584

1g £4.89

Albumen egg powder

CAS No: 9006-59-1
EEC No: 232-692-7

E8A65614

50g £5.49

E8A65626

100g £9.95

E8L77525

250g £34.95

Alum Ammonium

See Aluminium ammonium sulfate

Alum Potassium

See Aluminium potassium sulfate

Alumina

See Aluminium oxide

Aluminium ammonium sulfate-12-water

Alternative Description: Alum ammonium
Formula: $\text{Al}(\text{SO}_4)_3(\text{NH}_4)_2 \cdot 12\text{H}_2\text{O}$
M.W. 453.33
CAS No: 7784-26-1
EEC No: 232-055-3
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

E8A65687

500g £13.95

Aluminium chloride-6-water

Formula: $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$
M.W. 241.43
CAS No: 7784-13-6
EEC No: 231-208-1
Danger

Hazard: H314
Precaution: P280, P305+P351+P338

E8A65699

100g £9.19

Aluminium metal leaf

E8A65675

pack 24 £13.95

Aluminium nitrate-9-water

Formula: $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
M.W. 375.13
CAS No: 7784-27-2
EEC No: 236-751-8
Warning

Hazard: H272, H315, H319
Precaution: P220, P305+P351+P338

E8A65705

250g £9.79

Aluminium oxide

Alternative Description: Alumina
Formula: Al_2O_3
M.W. 101.96
CAS No: 1344-28-1
EEC No: 215-691-6

E8A65717

500g £7.99

Aluminium potassium sulfate-12-water

Alternative Description: Alum potassium
Formula: $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
M.W. 474.38
CAS No: 7784-24-9
EEC No: 233-141-3

E8A65729

500g £8.89

E8A65730

1kg £16.95

Aluminium powder fine

Formula: Al
M.W. 26.98
Danger
Hazard: H250, H261
Precaution: P222, P231+P232, P422

E8A65663

250g £12.95

Aluminium rivets

E8A42614

100g £9.95

Aluminium sulfate-16-water

Formula: $\text{Al}_2(\text{SO}_4)_3 \cdot 16\text{H}_2\text{O}$
M.W. 630.38
CAS No: 7784-31-8
EEC No: 233-135-0
Danger
Hazard: H318
Precaution: P280, P305+P351+P338

E8A65742

250g £4.89

2-Amino-3-Phenylpropionic acid

See DL-beta-phenylalanine

Aminoacetic acid chromatography

Alternative Description: Glycine
Formula: $\text{NH}_2\text{CH}_2\text{COOH}$
M.W. 75.07

E8A65754

100g £7.39

2-Aminopropanoic acid

See L-Alanine

Ammonia solution

Formula: NH_3
M.W. 17.03
CAS No: 1336-21-6
EEC No: 215-647-6
Danger
Hazard: H314, H400
Precaution: P273, P280, P305+P351+P338

Ammonia solution 35% AR

E8F5665

2.5L £9.19

Ammonia solution 35% w/w HR

E8A65778

1L £7.89

Ammonium carbonate



Formula: $(\text{NH}_4)_2\text{CO}_3 \cdot \text{H}_2\text{O}$
 M.W. 157.13
 CAS No: 10361-29-2
 EEC No: 233-786-0
 Warning
 Hazard: H302
 Precaution: P301+P312

EBF75689

500g **£7.59**

Ammonium chloride



Formula: NH_4Cl
 M.W. 53.49
 CAS No: 12125-02-9
 EEC No: 235-186-4
 Warning
 Hazard: H302, H319
 Precaution: P305+P351+P338

Ammonium chloride

EBF75690

500g **£6.29**

Ammonium chloride HR

EBA65845

1kg **£9.59**

Ammonium dichromate(VI)



Alternative Description: Ammonium pyrochromate
 Formula: $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
 M.W. 252.06
 CAS No: 7789-09-5
 EEC No: 232-143-1
 Danger
 Hazard: H272, H350, H340, H360, H330, H301, H372, H312, H314, H334, H317, H410
 Precaution: P201, P220, P260, P273, P280, P284

EBA65857

250g **£38.95**

Ammonium ethanedioate-1-water



Alternative Description: Ammonium oxalate
 Formula: $(\text{COONH}_4)_2 \cdot \text{H}_2\text{O}$
 M.W. 142.11
 CAS No: 6009-70-7
 EEC No: 214-202-3
 Warning
 Hazard: H312, H310
 Precaution: P280

EBA65869

100g **£10.95**

Ammonium ferric sulfate

See Ammonium iron(III) sulfate-12-water

Ammonium heptamolybdate

See Ammonium molybdate-4-water

Ammonium iron(II) sulfate-6-water HR



Alternative Description: Ferrous ammonium sulfate
 Formula: $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$
 M.W. 392.13
 CAS No: 7783-85-9
 EEC No: 233-151-8
 Warning
 Hazard: H315, H319, H335
 Precaution: P261, P305+P351+P338

EBA65870

250g **£17.95**

EBA65882

500g **£27.95**

Ammonium iron(III) sulfate-12-water



Alternative Description: Ferric ammonium sulfate
 Formula: $\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
 M.W. 482.18
 CAS No: 7783-83-7
 EEC No: 233-382-4
 Warning
 Hazard: H315, H319
 Precaution: P305+P351+P338

EBA65894

500g **£28.95**

Ammonium metavanadate



Alternative Description: Ammonium monovanadate
 Formula: NH_4VO_3
 M.W. 116.98
 CAS No: 7803-55-6
 EEC No: 232-261-3
 Danger
 Hazard: H301, H315, H319, H330, H335
 Precaution: P260, P284, P305+P351+P338, P310

EBA65973

50g **£24.95**

Ammonium molybdate-4-water AR



Alternative Description: Ammonium heptamolybdate
 Formula: $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$
 M.W. 1235.8
 CAS No: 12054-85-2
 EEC No: 234-722-4
 Warning
 Hazard: H315, H319, H335
 Precaution: P261, P305+P351+P338

EBF75768

100g **£23.95**

Ammonium monovanadate

See Ammonium metavanadate

Ammonium nitrate HR



Formula: NH_4NO_3
 M.W. 80.04
 CAS No: 6484-52-2
 EEC No: 229-347-8

EBA65924

500g **£14.95**

Ammonium oxalate

See Ammonium ethanedioate

Ammonium pyrochromate

See Ammonium dichromate(VI)

Ammonium sulfate

Formula: $(\text{NH}_4)_2\text{SO}_4$
 M.W. 132.13
 CAS No: 7783-20-2
 EEC No: 231-984-1

Ammonium sulfate

EBF75847

500g **£4.79**

Ammonium sulfate AR

EBF75860

500g **£6.29**

Ammonium sulfate LR

EBA65959

1kg **£8.79**

Ammonium thiocyanate

See Ammonium thiocyanate

Ammonium thiocyanate



Alternative Description: Ammonium isothiocyanate,
 Ammonium rhodanide
 Formula: NH_4SCN
 M.W. 76.12
 CAS No: 1762-95-4
 EEC No: 217-175-6
 Warning
 Hazard: H302, H312, H332, H410
 Precaution: P273, P280, P501

EBA65961

100g **£7.19**

Amyl acetate

See Pentyl acetate (pentylethanoate)

Amyl alcohol

See Pentan-1-ol

Aniline

See Phenylamine

Aniline blue



Alternative Description: China blue
 CAS No: 28631-66-5
 EEC No: 249-113-9
 Warning
 Hazard: H302, H315, H319, H336
 Precaution: P261, P305+P351+P338

EBA65985

25g **£10.95**

Aniline hydrochloride

See Phenylammonium Chloride

Anti-bumping granules

Alternative Description: Alumina
 CAS No: 1344-28-1
 EEC No: 215-691-6

EBF75926

250g **£6.69**

Aquadag

See Carbon (graphite) colloidal

L-Ascorbic acid powder

Alternative Description: Vitamin C
 Formula: $\text{C}_6\text{H}_8\text{O}$
 M.W. 176.13
 CAS No: 50-81-7
 EEC No: 200-066-2

EBA66009

50g **£5.39**

EBA66011

250g **£17.95**

Barfoed's reagent



Warning
 Hazard: H411
 Precaution: P273
EBA66035

500mL **£10.95**

Barium carbonate



Formula: BaCO₃
 M.W. 197.34
 CAS No: 513-77-9
 EEC No: 208-167-3
 Warning
 Hazard: H302
 Precaution: P301+P310

E8A66047

500g £11.95

Barium chloride-2-water



Formula: BaCl₂·2H₂O
 M.W. 244.27
 CAS No: 10326-27-9
 EEC No: 235-788-1
 Danger
 Hazard: H301, H332
 Precaution: P301+P310

Barium chloride-2-water

E8A66059

250g £10.95

E8F75975

500g £10.95

Barium chloride-2-water AR

E8F75987

500g £26.95

Barium hydroxide-8-water



Formula: Ba(OH)₂·8H₂O
 M.W. 315.47
 CAS No: 12230-71-6
 EEC No: 241-234-5
 Danger
 Hazard: H302, H314, H332
 Precaution: P280, P305+P351+P338, P310

E8A66072

500g £23.95

Barium nitrate



Formula: Ba(NO₃)₂
 M.W. 261.34
 CAS No: 10022-31-8
 EEC No: 233-020-5
 Danger
 Hazard: H272, H302, H319, H332
 Precaution: P220, P305+P351+P338

E8A66084

250g £12.95

Barium peroxide



Formula: BaO₂
 M.W. 169.33
 CAS No: 1304-29-6
 EEC No: 215-128-4
 Danger
 Hazard: H272, H302, H332
 Precaution: P220

E8A66096

250g £52.95

Barium sulfate

Formula: BaSO₄
 M.W. 233.39
 CAS No: 7727-43-7
 EEC No: 218-784-4

E8F75999

500g £6.69

Benedict's solution



Hazard: H412
 Precaution: P273
 E8A66114
 E8A66126

1L £4.39

2.5L £12.95

Benzaldehyde (Benzenecarbaldehyde)



Alternative Description: Bitter almond oil
 Formula: C₆H₅CHO
 M.W. 106.12
 Flash Point: 64 °C
 CAS No: 100-52-7
 EEC No: 202-860-4
 Warning
 Hazard: H302
 Precaution: P301+P312

E8A66138

500mL £20.95

Benzene-1,2-diol



Alternative Description: Catechol
 Formula: C₆H₄(OH)₂
 Warning
 Hazard: H302, H312, H315, H319
 Precaution: P280, P305+P351+P338

E8A66149

100g £14.95

Benzene-1,3-diol



Alternative Description: Resorcinol
 Formula: C₆H₄(OH)₂
 M.W. 110.11
 Warning
 Hazard: H302, H315, H319, H400
 Precaution: P273, P280, P305+P351+P338

E8A66151

50g £26.95

Benzene-1,3,5-triol



Alternative Description: Phloroglucinol
 Formula: C₆H₃(OH)₃·2H₂O
 M.W. 162.14
 CAS No: 108-73-6
 EEC No: 203-611-2
 Warning
 Hazard: H341, H361
 Precaution: P281

E8R04112

25g £21.95

Benzene-1,4-diol



Alternative Description: Hydroquinone, Quinol
 Formula: C₆H₄(OH)₂
 M.W. 110.11
 CAS No: 106-34-3
 EEC No: 203-387-6
 Danger
 Hazard: H351, H341, H302, H318, H317, H400
 Precaution: P273, P280, P305+P351+P338

E8A66163

100g £15.95

Benzenecarboxylic acid

See Benzoic acid

Benzoic acid



Alternative Description: Benzenecarboxylic Acid
 Formula: C₆H₅COOH
 M.W. 122.12
 CAS No: 65-85-0
 EEC No: 200-618-2
 Warning
 Hazard: H302, H319
 Precaution: P301+P312, P305+P351+P338

E8A66242

250g £12.95

E8A66254

500g £16.95

Benzoyl chloride



Formula: C₆H₅COCl
 M.W. 140.57
 Flash Point: 72 °C
 CAS No: 98-88-4
 EEC No: 202-710-8
 Danger
 Hazard: H314
 Precaution: P280, P305+P351+P338, P310

E8A66266

100mL £9.95

Bicarbonate indicator

E8A66278

100mL £3.19

E8A66289

500mL £3.69

Bile salts

See Sodium tauroglycocholate

Bitter almond oil

See Benzaldehyde - Benzenecarbaldehyde

Biuret reagent



E8A66291

500mL £4.99

Borax, Sodium borate

See Disodium tetraborate(III)-10-water

Boric acid

See Trioxoboric(III) acid

Brass filings

E8A66321

250g £15.95

Bromine



Formula: Br
 M.W. 79.90
 CAS No: 7726-95-6
 EEC No: 231-778-1
 Danger
 Hazard: H314, H330, H400
 Precaution: P280, P305+P351+P338, P310, P273

E8L77409

100mL £30.95

1-Bromobutane



Alternative Description: n-Butyl bromide
Formula: $\text{CH}_3(\text{CH}_2)_3\text{Br}$
M.W. 137.02
Flash Point: 23°C
CAS No: 109-65-9
EEC No: 203-691-9
Danger
Hazard: H225, H315, H319, H335, H411
Precaution: P210, P261, P273, P305+P351+P338

E8A66394 250mL **£24.95**

2-Bromo-2-methylpropane



Alternative Description: tert-Butyl bromide
Formula: $(\text{CH}_3)_3\text{CBr}$
M.W. 137.02
Flash Point: 18°C
CAS No: 507-19-7
EEC No: 208-065-9
Danger
Hazard: H225
Precaution: P210

E8A66436 100mL **£46.95**

Bromocresol green

Alternative Description: Green
Formula: $\text{C}_{27}\text{H}_{14}\text{Br}_4\text{O}_5\text{S}$
M.W. 698.01
CAS No: 76-60-8
EEC No: 200-972-8

E8A66400 1g **£4.39**
E8R04070 5g **£14.95**

Bromophenol blue

Formula: $\text{C}_{19}\text{H}_{10}\text{Br}_4\text{O}_5\text{S}$
M.W. 669.96
CAS No: 62625-28-9
EEC No: 263-657-4

E8A66448 5g **£7.59**

Bromophenol blue solution



Alternative Description: Bromophenol blue 0.04% in ethanol
Flash Point: 20°C
CAS No: 115-39-9

E8A66459 100mL **£4.39**
E8F76086 500mL **£10.95**

Bromothymol blue



Formula: $\text{C}_{27}\text{H}_{14}\text{Br}_4\text{O}_5\text{S}$
M.W. 624.38
CAS No: 76-59-5
EEC No: 200-971-2

E8A66461 5g **£6.49**

Bromothymol blue solution

Alternative Description: Bromothymol blue in 0.04% ethanol solution
Flash Point: 20°C
CAS No: 76-59-5

E8A66473 100mL **£4.09**
E8F76098 500mL **£9.95**

Buffer solutions

Buffer solution pH2

E8R04756

500mL **£5.39**

Buffer solution pH3

E8R04757

500mL **£5.39**

Buffer solution pH4

E8R04758

500mL **£5.39**

Buffer solution pH5

E8R04759

500mL **£5.39**

Buffer solution pH6

E8R04760

500mL **£5.39**

Buffer solution pH7

E8R04761

500mL **£5.39**

Buffer solution pH8

E8R04762

500mL **£5.39**

Buffer solution pH9

E8R04763

500mL **£5.39**

Buffer solution pH10

E8R04764

500mL **£5.39**

Buffer tablets

To make 100mL

Buffer tablets pH4

E8R04765

pack 50 **£15.95**

Buffer tablets pH7

E8R04766

pack 50 **£15.95**

Buffer tablets pH9.22

E8R04767

pack 50 **£15.95**

Butan-1-ol



Alternative Description: n-Butyl-alcohol
Formula: $\text{CH}_3(\text{CH}_2)_3\text{OH}$
M.W. 74.12
Flash Point: 30°C
CAS No: 71-36-3
EEC No: 200-751-6
Danger
Hazard: H226, H302, H335, H315, H318, H336
Precaution: P261, P280, P305+P351+P338

E8A66552 500mL **£6.99**
E8F76104 2.5L **£13.95**

Butan-2-ol



Alternative Description: sec-Butyl alcohol
Formula: $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$
M.W. 74.12
Flash Point: 23°C
CAS No: 78-92-2
EEC No: 201-158-5
Warning
Hazard: H226, H319, H335, H336
Precaution: P261, P305+P351+P338

E8A66576 500mL **£10.95**

Butanal



Alternative Description: Butyraldehyde
Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
M.W. 72.11
Flash Point: -11°C
CAS No: 123-72-8
EEC No: 204-646-6
Danger
Hazard: H225
Precaution: P210

E8A66527 250mL **£11.95**
E8R04072 500mL **£22.95**

Butanedioic acid



Alternative Description: Succinic acid
Formula: $\text{HOOCCH}_2\text{CH}_2\text{COOH}$
M.W. 118.09
CAS No: 110-15-6
EEC No: 203-740-4
Danger
Hazard: H315, H318, H335
Precaution: P261, P280, P305+P351+P338

E8A66539 100g **£9.59**

Butanoic acid



Alternative Description: Butyric acid
Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
M.W. 88.11
Flash Point: 67°C
CAS No: 107-92-6
EEC No: 203-532-3
Danger
Hazard: H314
Precaution: P280, P305+P351+P338, P310

E8A66540 100mL **£7.89**
E8R04073 250mL **£16.95**

Butanone (MEK)



Alternative Description: Methyl ethyl ketone (MEK)
Formula: $\text{C}_4\text{H}_8\text{O}$
M.W. 72.11
Flash Point: -1°C
CAS No: 78-93-3
EEC No: 201-159-0
Danger
Hazard: H225, H319, H336
Precaution: P210, P280, P305+P351+P338

E8F76128 500mL **£6.99**
E8R04074 2.5L **£26.95**

Butylamine



Formula: $\text{CH}_3(\text{CH}_2)_3\text{NH}_2$
M.W. 73.14
Flash Point: -38°C
CAS No: 75-64-9
EEC No: 200-888-1
Danger
Hazard: H225, H332, H312, H302, H314
Precaution: P210, P280, P305+P351+P338, P310

E8A66599 250mL **£14.95**

Butyraldehyde

See Butanal

Butyric acid

See Butanoic acid

Calcium carbide



Formula: CaC_2
 M.W. 64.1
 CAS No: 75-20-7
 EEC No: 200-848-3
 Danger
 Hazard: H260
 Precaution: P223, P231+P232, P370+P378

EBR04768 100g **£7.59**

Calcium carbonate

Formula: CaCO_3
 M.W. 100.09
 CAS No: 471-34-1
 EEC No: 207-439-9
 Danger
 Hazard: H315, H318, H335
 Precaution: P261, P280, P305+P351+P338

Calcium carbonate precipitated

E8A66631 500g **£8.79**

E8A66655 3kg **£22.95**

Calcium carbonate HR

E8A66643 1kg **£9.59**

Calcium chloride



Formula: $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
 M.W. 219.08
 CAS No: 7774-34-7
 EEC No: 233-140-8
 Warning
 Hazard: H319
 Precaution: P305+P351+P338

Calcium chloride-6-water

E8F76268 500g **£23.95**

Calcium chloride anhydrous prill

E8A66680 500g **£10.95**

Calcium chloride anhydrous granular

E8A66679 500g **£4.99**

Calcium granules



Formula: Ca
 M.W. 40.08
 CAS No: 7440-70-2
 EEC No: 231-179-5
 Danger
 Hazard: H261
 Precaution: P223+P232, P422

E8A66606 50g **£12.95**

EBR04075 100g **£15.95**

Calcium hydroxide solution

See Limewater

Calcium hydroxide technical



Alternative Description: Slaked lime
 Formula: $\text{Ca}(\text{OH})_2$
 M.W. 74.09
 CAS No: 1305-62-0
 EEC No: 215-137-3
 Danger
 Hazard: H318
 Precaution: P280, P305+P351+P338

E8A66692 1kg **£4.99**

Calcium nitrate-4-water



Formula: $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
 M.W. 236.15
 CAS No: 13477-34-4
 EEC No: 233-332-1
 Warning
 Hazard: H272, H319
 Precaution: P220, P305+P351+P338

E8A66710 500g **£26.95**

Calcium oxide



Alternative Description: Quicklime
 Formula: CaO
 M.W. 56.08
 CAS No: 1305-78-8
 EEC No: 215-138-9
 Danger
 Hazard: H314
 Precaution: P280, P305+P351+P338, P310

Calcium oxide technical fine

EBR04076 500g **£10.95**

Calcium oxide technical

E8A66722 1kg **£6.59**

Calcium sulfate-1/2-water technical

Alternative Description: Plaster of Paris
 Formula: $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$
 M.W. 145.15

E8A66746 5kg **£12.95**

E8A66758 10kg **£23.95**

Calcium sulfate-2-water

Formula: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 M.W. 172.17
 CAS No: 10101-41-4
 EEC No: 231-900-3

EBF76323 500g **£5.39**

Canada balsam natural

Flash Point: 43°C
 CAS No: 8007-47-4
 EEC No: 232-362-2

E8A66783 50mL **£12.95**

Carbamide

See Urea

Carbol fuchsin

See Phenol-fuchsin

Carbon (graphite) colloidal

Alternative Description: Aquadag
 Warning
 Hazard: H319, H335
 Precaution: P261, P305+P351+P338

E8A66837 100g **£5.99**

Carbon (graphite)

Formula: C
 M.W. 12.01
 CAS No: 7782-42-5
 Warning
 Hazard: H319, H335
 Precaution: P261, P305+P351+P338

Carbon (graphite) powder - Activated

E8A66813 500g **£13.95**

Carbon (graphite) powder - Activated

E8A66825 1kg **£21.95**

Carmine acetic



Danger
 Hazard: H226, H314
 Precaution: P260, P280, P305+P351+P338

E8A66862 100mL **£7.59**

Casein powder

CAS No: 9000-71-9
 EEC No: 232-555-1
E8A66886 250g **£24.95**

Catechol

See Benzene-1,2-diol

Charcoal powder (animal)

Formula: C
 M.W. 12.01
 CAS No: 7440-44-0
 EEC No: 231-153-3

E8A66939 500g **£10.95**

China blue

See Aniline blue

Chlorine Water 0.1M



Density 1.00g/cm³ approx.
 Liberates chlorine

E8A66953 1L **£19.95**

1-Chlorobutane



Alternative Description: n-Butyl chloride
 Formula: $\text{CH}_3(\text{CH}_2)_3\text{Cl}$
 M.W. 92.57
 Flash Point: -6°C
 CAS No: 109-69-3
 EEC No: 203-696-6
 Danger
 Hazard: H225
 Precaution: P210

E8A66977 50mL **£9.59**

2-Chlorobutane



Alternative Description: sec-Butyl chloride
 Formula: $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$
 M.W. 92.57
 Flash Point: -10°C
 CAS No: 78-86-4
 EEC No: 201-151-7
 Danger
 Hazard: H225
 Precaution: P210

E8A66989 100mL **£21.95**

Chlorobenzene



Formula: C_6H_5Cl
M.W. 112.56
Flash Point: 28°C
CAS No: 108-90-7
EEC No: 203-628-5
Warning
Hazard: H226, H332, H411
Precaution: P273

EBA66965 100mL **£5.69**

2-Chloro-2-methylpropane



Alternative Description: tert-Butyl chloride
Formula: $(CH_3)_3CCl$
M.W. 92.57
Flash Point: -6°C
CAS No: 507-20-0
EEC No: 208-066-4
Danger
Hazard: H228
Precaution: P210

EBA66990 100mL **£13.95**

Chloroform

See Trichloromethane

Chromium(III) chloride-6-water



Alternative Description: Chromic chloride
Formula: $CrCl_3 \cdot 6H_2O$
M.W. 266.45
CAS No: 10060-12-5
EEC No: 233-038-3
Warning
Hazard: H302
Precaution: P201

EBA67040 100g **£18.95**

Chromium(III) nitrate-9-water



Alternative Description: Chromic nitrate
Formula: $Cr(NO_3)_3 \cdot 9H_2O$
M.W. 400.15
CAS No: 7789-02-8
EEC No: 236-921-1
Warning
Hazard: H272, H315, H319
Precaution: P220, P305+P351+P338

EBA67052 100g **£16.95**

Chromium(III) potassium sulfate-12-water



Alternative Description: Chromic potassium sulfate, chrome alun
Formula: $K_2Cr(SO_4)_2 \cdot 12H_2O$
M.W. 499.39
CAS No: 7788-99-0
EEC No: 233-401-6

EBA67064 500g **£24.95**

Chromium(III) sulfate-12-water



Formula: $Cr_2(SO_4)_3 \cdot 12H_2O$
EEC No: 234-638-8
Danger
Hazard: H302, H312, H314, H332
Precaution: P280, P305+P351+P338, P310

EBA67076 100g **£7.59**

Citric acid

See 2-Hydroxypropane-1,2,3-tricarboxylic acid

Clay powder

E8R04771 1kg **£6.29**

Cobalt(II) chloride-6-water



Alternative Description: Cobaltous chloride
Formula: $CoCl_2 \cdot 6H_2O$
M.W. 237.93
CAS No: 7791-13-1
EEC No: 231-589-4
Danger
Hazard: H350, H341, H360F, H302, H334, H317, H410
Precaution: P201, P261, P273, P280, P308+P313, P501

EBA67088 100g **£10.95**

EBA67099 250g **£39.95**

Cobalt(II) nitrate-6-water



Alternative Description: Cobaltous nitrate
Formula: $Co(NO_3)_2 \cdot 6H_2O$
M.W. 291.03
CAS No: 10026-22-9
EEC No: 233-402-1
Danger
Hazard: H272, H302, H317, H351, H400
Precaution: P220, P273, P280

EBA67106 100g **£12.95**

Cobalt(II) sulfate-7-water



Alternative Description: Cobaltous sulfate
Formula: $CoSO_4 \cdot 7H_2O$
M.W. 281.10
CAS No: 10026-24-1
EEC No: 233-334-2
Danger
Hazard: H350, H341, H360F, H302, H334, H317, H410
Precaution: P201, P261, P273, P280, P308+P313, P501

EBA67118 100g **£11.95**

Congo red dry



CAS No: 573-58-0
EEC No: 209-358-4
Danger
Hazard: H350, H361d
Precaution: P201, P281, P308+P313

EBA67129 5g **£4.39**

Copper(II) carbonate (basic) HR



Alternative Description: Cupric carbonate
Formula: $CuCO_3 \cdot Cu(OH)_2 \cdot H_2O$
M.W. 239.1
CAS No: 12069-69-1
EEC No: 235-113-6
Warning
Hazard: H302, H315, H319, H335
Precaution: P261, P305+P351+P338

EBA67179 250g **£8.79**

EBA67180 500g **£14.95**

EBA67192 1kg **£23.95**

Copper(I) chloride



Alternative Description: Cuprous chloride
Formula: $CuCl$
M.W. 99.00
CAS No: 7758-89-6
EEC No: 231-842-9
Warning
Hazard: H302, H410
Precaution: P273, P501

EBA67209 50g **£9.95**

Copper(II) chloride-2-water



Alternative Description: Cupric chloride
Formula: $CuCl_2 \cdot 2H_2O$
M.W. 170.48
CAS No: 10125-13-0
EEC No: 231-210-2
Warning
Hazard: H302, H315, H319, H335, H410
Precaution: P261, P273, P305+P351+P338

EBA67210 250g **£8.19**

Copper

Formula: Cu
M.W. 63.55
CAS No: 7440-50-8
EEC No: 231-159-6

Copper foil

EBA67131 250g **£15.95**

Copper millings

EBA67143 500g **£18.95**

Copper rivets

EBA42638 250g **£10.95**

Copper powder fine



Formula: Cu
M.W. 63.55
CAS No: 7440-50-8
EEC No: 231-159-6
Danger

Hazard: H228, H410

Precaution: P210, P273, P501

EBA67155 50g **£7.59**

EBA67167 100g **£8.39**

Copper(II) nitrate-2-water



Alternative Description: Cupric nitrate
Formula: $Cu(NO_3)_2 \cdot 2H_2O$
M.W. 241.60
CAS No: 10031-43-3
EEC No: 221-838-5
Danger
Hazard: H272, H302, H315, H318
Precaution: P220, P280, P302+P351+P338

EBA67234 250g **£9.79**

EBA67246 500g **£14.95**

Copper(I) oxide (red)



Alternative Description: Cuprous oxide
Formula: Cu_2O
M.W. 143.09
CAS No: 1317-39-1
EEC No: 215-270-7
Warning
Hazard: H302, H410
Precaution: P273, P501

EBA67258 100g **£8.19**

E8R04078 500g **£34.95**

Copper(II) oxide (black)

Alternative Description: Cupric oxide
Formula: CuO
M.W. 79.55
CAS No: 1317-38-0
EEC No: 215-269-1
Warning
Hazard: H302, H410
Precaution: P273, P501

Copper (II) Oxide (Black)

E8A67269 250g **£8.59**

E8A67271 500g **£14.95**

Copper(II) oxide (wire form)

E8A67283 100g **£9.89**

Copper(II) sulfate**Copper(II) sulfate 0.5M**

Alternative Description: Cupric sulfate solution
Warning
Hazard: H411
Precaution: P273
E8A67349 1L **£6.29**

Copper(II) sulfate anhydrous

E8A67350 250g **£10.95**



Alternative Description: Cupric sulfate anhydrous
Formula: CuSO₄
M.W. 159.60
CAS No: 7758-98-7
EEC No: 231-847-6
Warning
Hazard: H302, H319, H315, H410
Precaution: P273, P305+P351+P338, P501



Alternative Description: Cupric sulfate
Formula: CuSO₄·5H₂O
M.W. 249.68
CAS No: 7758-99-7
EEC No: 231-847-6
Warning
Hazard: H302, H319, 315, H410
Precaution: P273, P305+P351+P338, P501

Copper(II) sulfate-5-water

E8F76530 500g **£5.69**

E8A67325 3kg **£25.95**

Copper(II) sulfate-5-water AR

E8F76542 500g **£22.95**

Copper(II) sulfate-5-water HR

E8A67313 1kg **£10.95**

Crude Oil (Artificial) based on CLEAPSS formula

Danger
Hazard: H350, H304, H319
Precaution: P281, P301+P310, P331, P305+P351+P338
E8A69747 500mL **£15.95**

Crystal violet

Formula: C₂₅H₃₀ClN₃
M.W. 407.99
CAS No: 548-62-9
EEC No: 208-953-6
Danger
Hazard: H318, H410
Precaution: P273, P280, P305+P351+P338, P501
E8A67386 5g **£4.99**



Warning
Hazard: H226, H315, H351, H411
Precaution: P273, P281, P305+P351+P338

Crystal violet 1.0% alcoholic solution

E8A67398 100mL **£4.99**

Crystal violet 2.0% alcoholic solution

E8A67404 100mL **£3.19**

Cyclohexane

Formula: CH₂(CH₂)₄CH₂
M.W. 84.16
Flash Point: -18°C
CAS No: 110-82-7
EEC No: 203-806-2
Danger
Hazard: H225, H304, H315, H336, H410
Precaution: P210, P261, P271, P301+P310, P331, P501
E8A67416 250mL **£4.79**
E8A67428 500mL **£7.59**

Cyclohexanol

Formula: CH₂(CH₂)₄CHOH
M.W. 100.16
Flash Point: 68°C
CAS No: 108-93-0
EEC No: 203-630-6
Warning
Hazard: H332, H302, H335, H315
Precaution: P261
E8A67439 250mL **£11.95**
E8A67441 500mL **£18.95**

Cyclohexene

Formula: CH₂CH(CH₂)₃CH₂
M.W. 82.15
Flash Point: -20°C
CAS No: 110-83-8
EEC No: 203-807-8
Danger
Hazard: H225, H302, H311
Precaution: P210, P280, P312
E8A67453 250mL **£14.95**

Decane

Formula: CH₃(CH₂)₈CH₃
M.W. 142.28
Flash Point: 46°C
CAS No: 124-18-5
EEC No: 204-686-4
Danger
Hazard: H226, H304
Precaution: P301+P310, P331
E8A67465 100mL **£24.95**

Decanedioyl dichloride 5% solution

Alternative Description: Sebacoyl chloride 5% in cyclohexane
Danger
Hazard: H225, H304, H315, H336, H410
Precaution: P210, P273, P280, P301+P330+P331, P307+P311
E8A67477 100mL **£9.19**

2,6-Dichlorophenolindophenol

Alternative Description: DCPIP

E8F67681 pack 20 **£8.89**

E8A67532 1g **£6.29**

2,2-Dihydroxy-1,3-dioxahydindene

See Ninhydrin (Indanetrione hydrate)

Devarda's alloy powder

CAS No: 8049-11-4
Danger
Hazard: H228
Precaution: P210
E8R04772 100g **£9.19**

Di(dodecanoyl) peroxide

Alternative Description: Lauroyl peroxide
Formula: [CH₃(CH₂)₁₀COO]₂O₂
CAS No: 105-74-8
EEC No: 203-326-3
Danger
Hazard: H242
Precaution: P220, P280, P410, P420
E8A67556 5 X 5g **£13.95**

1,6-Diaminohexane

See Hexane-1,6-diamine

(+) 2,3-Dihydroxybutanedioic acid

Alternative Description: Tartaric acid
Formula: (CHOHCOOH)₂
M.W. 150.09
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338
E8A67568 500g **£17.95**

1,5-diphenyl-3-thiocarbazone

See Dithionite

Diastase from malt

CAS No: 9000-92-4
EEC No: 232-567-7
Danger
Hazard: H334
Precaution: P261, P342+P311
E8R04773 100g **£14.95**

Dibutyl benzene-1,2-dicarboxylate

Alternative Description: Dibutyl phthalate
Formula: C₆H₄(COOC₄H₉)₂
M.W. 278.35
Danger
Hazard: H360Df, H400
Precaution: P201, P273, P308+P313
E8A67507 500mL **£17.95**

Dibutyl phthalate

See Dibutyl Benzene-1,2-Dicarboxylate

Dichloromethane



Alternative Description: Methylene chloride

Formula: CH_2Cl_2

M.W. 84.93

CAS No: 75-09-2

EEC No: 200-838-9

Warning

Hazard: H351

Precution: P281

E8F76657

500mL **£8.79**

E8F76669

2.5L **£19.95**

Diethyl ether

See Ethoxyethane

Dimethylbenzene



Alternative Description: Xylene

Formula: $\text{C}_6\text{H}_4(\text{CH}_3)_2$

M.W. 106.17

Flash Point: 24 °C

CAS No: 1330-20-7

EEC No: 215-535-7

Warning

Hazard: H226, H332, H312, H315

Precution: P280

E8F80703

2.5L **£19.95**

2,4-Dinitrophenylhydrazine



Formula: $\text{C}_6\text{H}_3\text{NHNH}_2(\text{NO}_2)_2$

M.W. 198.14

Danger

Hazard: H228, H302, H319

Precution: P210, P305+P351+P338

E8A67581

25g **£26.95**

Di-potassium hydrogen phosphate(V)

Alternative Description: Potassium phosphate dibasic

Formula: K_2HPO_4

M.W. 174.18

CAS No: 7758 11 4

EEC No: 231-834-5

E8A70397

250g **£19.95**

Di-sodium tetraborate(III)-10-water

Alternative Description: Borax, Sodium borate

Formula: $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

M.W. 381.37

CAS No: 1303-96-4

EEC No: 215-540-4

Danger

Hazard: H360FD

Precution: P201, P308+P313

E8A71651

1kg **£4.59**

Dithione



Alternative Description: 1,5-diphenyl-3-thiocarbazon

Formula: $\text{C}_{14}\text{H}_{12}\text{N}_4\text{S}_2$

CAS No: 60-10-6

EEC No: 200-454-1

Warning

Hazard: H315, H319, H335

Precution: P261, P305+P351+P338

E8R04774

1g **£6.99**

Dutch metal

EEC No: 231-165-9

E8A67635

book **£21.95**

EDTA - Disodium salt

Alternative Description: Ethylenediaminetetra-acetic acid

disodium salt

Formula: $(\text{CH}_2\text{N}(\text{CH}_2\text{COOH})\text{CH}_2\text{COONa})_2 \cdot 2\text{H}_2\text{O}$

M.W. 372.24

CAS No: 139-33-3

EEC No: 200-449-4

E8A67647

250g **£12.95**

E8R04080

500g **£19.95**

Eosin

CAS No: 548-26-5

Eosin powder

E8A67672

25g **£3.79**

Eosin 5% aqueous solution

E8A67660

100mL **£4.99**

Eriochrome black



Alternative Description: Solochrome, Mordant black 11

CAS No: 1787-61-7

EEC No: 217-250-3

E8A67684

25g **£7.19**

Ethanol



Alternative Description: Acetaldehyde

Formula: CH_3CHO

Flash Point: -27°C

CAS No: 75-07-4

EEC No: 200-836-8

Danger

Hazard: H224, H319, H335, H351

Precution: P210, P261, P281, P305+P351+P338

E8F75501

500mL **£19.95**

Ethanamide

See Acetamide

Ethane-1,2-diamine



Alternative Description: Ethylenediamine

Formula: $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

M.W. 60.10

Danger

Hazard: H314, H226, H302, H312, H317, H334

Precution: P261, P280, P305+P351+P338, P310

E8A67702

250mL **£10.95**

Ethanedioic acid-2-water



Alternative Description: Oxalic acid

Formula: $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$

M.W. 126.07

CAS No: 144-62-7

EEC No: 205-634-6

Warning

Hazard: H312, H302

E8A67714

250g **£4.39**

E8F78022

500g **£6.99**

Ethanoic acid

See Acetic acid

Ethanoic anhydride

See Acetic anhydride

Ethanol



Duty paid

Alternative Description: Ethyl alcohol

Formula: $\text{CH}_3\text{CH}_2\text{OH}$

M.W. 46.07

Flash Point: 12°C

CAS No: 64-17-5

EEC No: 200-578-6

Danger

Hazard: H225, H371

Precution: P210, P260

Ethanol absolute

E8A67738

100mL **£11.95**

E8A67749

250mL **£31.95**

Ethanol absolute AR

E8F76864

500mL **£56.95**

E8F76876

2.5L **£239.95**

Ethanol industrial (99% IDA) (74 OP)

E8F76931*

2.5L **£9.95**

E8R04081*

pack 4 X 2.5L **£33.95**

Ethanol mineralised 90% v/v (64 OP)

E8F76899

2.5L **£9.95**

E8R04082

pack 4 X 2.5L **£35.95**

Ethanol rectified



E8A67751*

500mL **£3.19**

Ethanol chloride



Alternative Description: Acetyl chloride

Formula: CH_3COCl

M.W. 78.50

Flash Point: 4°C

CAS No: 75-36-5

EEC No: 200-865-6

Danger

Hazard: H225, H314, EUH014

Precution: P210, P280, P305+P351+P338, P310

E8A65535

100mL **£15.95**

Ethoxyethane



Alternative Description: Diethyl ether

Formula: $(\text{C}_2\text{H}_5)_2\text{O}$

M.W. 74.12

Flash Point: 44°C

CAS No: 60-29-7

EEC No: 203-804-1

Danger

Hazard: H224, H302, H336, EUH019, EUH066

Precution: P210, P261

E8A67787

500mL **£11.95**

Practical
Information

REQUIRED PERMIT

* Customers who would like to order these items but do not have the required permit are advised to get in touch with HMRC's Glasgow office on **0141 555 3586**

Ethyl acetate



Alternative Description: Ethyl ethanoate
Formula: $\text{CH}_3\text{COOC}_2\text{H}_5$
M.W. 88.11
Flash Point: -4°C
CAS No: 141-78-6
EEC No: 205-500-4
Danger
Hazard: H225, H319, H336, EUH066
Precaution: P210, P261, P305+P351+P338
E8A67805 500mL **£6.99**
E8F76980 2.5L **£21.95**

Ethyl alcohol

See Ethanol Absolute

Ethyl benzoate

Formula: $\text{C}_9\text{H}_{10}\text{COOC}_2\text{H}_5$
M.W. 150.18
Flash Point: 84°C
CAS No: 93-89-0
EEC No: 202-284-3
E8A67830 100mL **£9.95**

Ethyl iodide

See Iodoethane

Ethyl Methyl Ketone

See Butanone

Ethylenediaminetetra-acetic acid

See EDTA

Fast green FCF



CAS No: 2353-45-9
EEC No: 219-091-5
Warning
Hazard: H341
Precaution: P280
E8A67854 5g **£12.95**

Fehling's solution no. 1



Warning
Hazard: H411
Precaution: P273
E8A67866 1L **£6.99**

Fehling's solution no. 2



Danger
Hazard: H314
Precaution: P280, P305+P351+P338
E8A67889 1L **£8.99**

Feulgen's stain

Alternative Description: Schiff's reagent
E8A67908 100mL **£6.99**

Fluorescein

Formula: $\text{C}_{20}\text{H}_{12}\text{O}_5$
M.W. 376.28
CAS No: 2321-07-5
EEC No: 219-031-8
E8A67919 5g **£4.39**
E8A67921 50g **£18.95**

Formaldehyde

See Methanol 40%

Formic acid 90%



Alternative Description: Methanoic acid
Formula: HCOOH
M.W. 46.03
Flash Point: 69°C
CAS No: 64-18-6
EEC No: 200-579-1
Danger
Hazard: H314, H226
Precaution: P280, P305+P351+P338, P310
E8A67933 500mL **£8.19**

D(-) Fructose

Alternative Description: Laevulose
Formula: $\text{OCH}_2(\text{CHOH})_4\text{CH}_2\text{OH}$
M.W. 180.16
CAS No: 57-48-7
EEC No: 200-333-3
E8A67969 25g **£4.39**
E8F77157 100g **£6.69**

D(+) Galactose

Formula: $\text{OCH}_2(\text{CHOH})_4\text{C}(\text{OH})\text{CH}_2\text{O}_2\text{H}_2\text{O}$
M.W. 180.16
CAS No: 59-23-4
EEC No: 200-416-4
E8R04084 100g **£36.95**

D(+) Galactose Anhydrous

Formula: $\text{OCH}_2(\text{CHOH})_4\text{C}(\text{OH})\text{CH}_2\text{O}$
M.W. 180.16
CAS No: 59-23-4
EEC No: 200-416-4
E8A67970 25g **£10.95**

Gelatine powder (150 Blume)

CAS No: 9000-70-8
EEC No: 232-554-6
E8A67982 250g **£8.79**
E8R04085 500g **£17.95**

Gibberellic acid

CAS No: 77-06-5
EEC No: 201-001-0
Warning
Hazard: H319
Precaution: P305+P351+P338
E8R04775 1g **£18.95**

Glass spheres

For use in crystal model analogues and anti-bumping in preparative organic chemistry. 3-7mm size range.
E8A81899 500g **£12.95**

D(+) Glucose

D(+) Glucose anhydrous
Formula: $\text{O}(\text{CHOH})_4\text{CH}_2\text{OH}$
M.W. 180.16
CAS No: 50-99-7
EEC No: 200-075-1
E8F77169 500g **£7.59**
E8A67994 1kg **£10.95**

D(+) Glucose monohydrate

Formula: $\text{O}(\text{CHOH})_4\text{CH}_2\text{OH} \cdot \text{H}_2\text{O}$
M.W. 180.16
CAS No: 50-99-7
EEC No: 200-075-1
E8L77537 250g **£3.79**
E8A68007 1kg **£9.95**

Glucose-1-phosphoric acid disodium salt

E8A68020 1g **£4.39**
E8R04086 5g **£15.95**

Glycerol

See Propane-1,2,3-triol

Glycine

See Aminoacetic acid (chromatography)

Gram's iodine solution

E8A68032 100mL **£6.29**
E8A68044 250mL **£12.95**

Group 1 metals collection (Li, Na, K)



Alternative Description: lithium, sodium & potassium
Danger
Hazard: H260, H314, EUH014
Precaution: P223, P231+P232, P280, P305+P351+P338, P310, P370+P378
An export permit is required for this item
E8L19434 kit **£43.95**

Heptan-1-ol



Formula: $\text{CH}_3(\text{CH}_2)_5\text{CH}_2\text{OH}$
Alternative Description: Heptyl alcohol
Flash Point: 73°C
CAS No: 111-70-6
EEC No: 203-897-9
Warning
Hazard: H302, H312, 319
Precaution: P280, P305+P351+P338
E8A68079 250mL **£19.95**

Heptane



Formula: C_7H_{16}
M.W. 100.20
Flash Point: -4°C
CAS No: 142-82-5
EEC No: 205-563-8
Danger
Hazard: H225, H304, H315, H336, H410
Precaution: P210, P261, P273, P301+P310, P331, P501
E8A8068 500mL **£11.95**

Heptyl alcohol

See Heptan-1-ol

Hexan-1-ol



Alternative Description: Hexyl alcohol
Formula: $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$
M.W. 102.18
Warning
Hazard: H302
E8A68135 500mL **£29.95**

N-Hexane



Formula: C_6H_{14}
Flash Point: -22°C
CAS No: 110-54-3
EC No: 203-777-6
Danger
Hazard: H225, H361F, H304, H373, H315, H336, H411
Precaution: P210, P261, P273, P281, P301+P310, P331
E8R04101 500mL **£15.95**

Hexane fraction



Formula: C_6H_{14}
M.W: 86.18
Flash Point: -22°C
CAS No: 110-54-3
EC No: 203-777-6
Danger
Hazard: H225, H361F, H304, H373, H315, H336, H411
Precaution: P210, P261, P273, P281, P301+P310, P331
E8A68109 500mL **£10.95**

Hexane-1,6-diamine

Hexane-1,6-diamine 5% solution



Warning
Hazard: H315, H319
Precaution: P280, P305+P351+P338
E8L77471 250mL **£4.39**

Hexane-1,6-diamine powder



Alternative Description: 1,6-diaminohexane
Formula: $NH_2(CH_2)_6NH_2$
M.W: 116.21
CAS No: 124-09-4
EC No: 204-679-6
Danger
Hazard: H314, H302, H312, H335
Precaution: P261, P280, P309, P310, P305+P351+P338
E8A68111 25g **£6.29**

Hexyl alcohol

See Hexan-1-ol

Hydrochloric acid

Formula: HCl
M.W: 36.46
CAS No: 7647-01-0
M.W: 231-595-7
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

Hydrochloric acid 0.1M

E8F77399 2.5L **£9.95**

Hydrochloric acid 0.5M

E8F77388 2.5L **£14.95**

Hydrochloric acid 1.0M

E8A68238 1L **£4.99**

E8F77364 2.5L **£10.95**

E8L77549 5L **£19.95**



Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

Hydrochloric acid 2.0M

E8A68214 1L **£5.69**

E8A68226 2.5L **£12.95**

Hydrochloric acid 4.0M

E8A68202 1L **£21.95**

Hydrochloric acid 5.0M

E8A68196 1L **£22.95**



Danger
Hazard: H314, H335
Precaution: P261, P280, P305+P351+P338, P310

Hydrochloric acid 35% w/w AR

E8L19288 1L **£5.79**

Hydrochloric acid 35% w/w Tech

E8L19299 1L **£5.69**

Hydrochloric acid 36%

E8A68147 1L **£6.99**

Hydrogen peroxide



Formula: H_2O_2
M.W: 34.01
CAS No: 7722-84-1
EC No: 231-765-0
Danger
Hazard: H271, H332, H302, H314
Precaution: P210, P280, P301+P330+P331, P304+P340, P309+P310

Hydrogen peroxide (100 vol) 30% w/v

E8F77467 500mL **£5.69**

E8R04087 4 X 2.5L **£37.95**

Hydrogen peroxide (20 vol) Tech

E8A68299 1L **£8.19**

Hydroquinone, Quinol

See Benzene-1,4-diol

2-Hydroxybenzoic acid



Alternative Description: Salicylic acid
Formula: $C_6H_4(OH)COOH$
M.W: 138.12
CAS No: 69-72-7
EC No: 200-712-3
Danger

Hazard: H302, H318
Precaution: P280, P305+P351+P338

E8A68317 100g **£7.59**

E8A68329 500g **£27.95**

DL-2-Hydroxybutanedioic acid



Alternative Description: DL-Malic acid
Formula: $HOOCCH(OH)CH_2COOH$
M.W: 134.09
Flash Point: 203°C
CAS No: 617-48-1
EC No: 210-514-9
Danger
Hazard: H302, H315, H318, H335
Precaution: P261, P280, P305+P351+P338

E8A68330 250g **£15.95**

DL-2-Hydroxypropanoic acid



Alternative Description: Lactic acid
Formula: $CH_3CH(OH)COOH$
M.W: 90.08
CAS No: 598-82-3
EC No: 209-954-4
Danger

Hazard: H315, H318

Precaution: P280, P305+P351+P338

E8A68354 250mL **£6.29**

2-Hydroxypropane-1,2,3-tricarboxylic acid



Alternative Description: Citric acid
Formula: $C(OH)(COOH)(CH_2COOH)_2 \cdot H_2O$
M.W: 210.14

CAS No: 5949-29-1

EC No: 201-069-1

Danger

Hazard: H318, H335

Precaution: P261, P280, P305+P351+P338

2-Hydroxypropane-1,2,3-tricarboxylic acid

E8F76463 500g **£4.99**

E8R04065 3kg **£22.95**

2-Hydroxypropane-1,2,3-tricarboxylic acid AR

E8F76487 500g **£14.95**

E8F76499 2kg **£25.95**

IDA

See Ethanol industrial (99% IDA) (74 OP)

Indigo carmine



CAS No: 860-22-0

EC No: 212-728-8

Warning

Hazard: H302

E8A68366 5g **£5.69**

Iodine

Iodine 0.05M

CAS No: 7732-56-2

EC No: 231-442-4

E8F77546 2.5L **£18.95**



Formula: I_2

M.W: 253.81

Warning

Hazard: H332, H312, H400

Precaution: P273, P280

Iodine AR

E8F77522 100g **£28.95**

Iodine resublimed

E8F77510 100g **£20.95**

E8R04089 500g **£67.95**

Iodine solution 1% in potassium iodide

E8A68389 1L **£9.95**

E8A68391 2.5L **£15.95**

1-Iodobutane



Alternative Description: n-Butyl iodide
Formula: $\text{CH}_3(\text{CH}_2)_3\text{I}$
M.W. 184.02
Flash Point: 34°C
CAS No: 542-69-8
EEC No: 208-163-1
Danger
Hazard: H226, H311
Precaution: P261, P311

E8A68421 25mL **£18.95**

Iodoethane



Alternative Description: Ethyl iodide
Formula: $\text{C}_2\text{H}_5\text{I}$
M.W. 155.97
Flash Point: 53°C
CAS No: 75-03-6
EEC No: 200-833-1
Danger
Hazard: H302, H315, H317, H319, H334
Precaution: P261, P280, P305+P351+P338, P342+P311

E8A68433 50mL **£26.95**

Iron(III) chloride

Iron(III) chloride anhydrous



Alternative Description: Ferric chloride
Formula: FeCl_3
M.W. 162.21
CAS No: 7705-08-0
EEC No: 231-729-4
Danger
Hazard: H302, H315, H318, H411
Precaution: P273, P280, P305+P351+P338

E8A68524 250g **£12.95**

Iron(III) chloride-6-Water



Alternative Description: Ferric chloride
Formula: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$
M.W. 270.30
CAS No: 10025-77-1
EEC No: 231-729-4
Danger
Hazard: H302, H314
Precaution: P273, P280, P305+P351+P338, P310

E8A68500 500g **£8.79**
E8A68512 1kg **£19.95**

Iron filings

Formula: Fe
M.W. 55.85

Iron filings fine

E8A68445 250g **£2.99**
E8A68457 500g **£4.09**
E8A68469 1kg **£6.29**

Iron filings coarse

E8A68470 500g **£3.79**

Iron(III) nitrate-9-water



Alternative Description: Ferric nitrate
Formula: $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
M.W. 404.0
CAS No: 7782-61-8
EEC No: 233-899-5
Warning
Hazard: H272, H315, H319, H335
Precaution: P201, P273, P308+P313+P508

E8A68548 100g **£8.79**

Iron(II,III) oxide



Alternative Description: Iron(II,III) oxide black
Formula: $\text{FeO} \cdot \text{Fe}_2\text{O}_3$
CAS No: 1317-61-9
EEC No: 215-277-5
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

E8A68536 500g **£6.99**

Iron(II) sulfate



Alternative Description: Ferrous sulfate
Formula: $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
M.W. 278.01
CAS No: 7782-63-0
EEC No: 231-753-5
Warning
Hazard: H302

Iron(II) sulfate-7-water

E8A68561 250g **£9.59**
E8F77089 500g **£13.95**

Iron(II) sulfate-7-water AR

E8F77108 500g **£9.95**

Iron(II) sulfide lump



Alternative Description: Ferrous sulfide
Formula: FeS
M.W. 87.91
Warning
Hazard: H400
Precaution: P273

E8A68597 500g **£53.95**

Isobutyl alcohol

See 2-Methylpropan-1-ol

Isopropanol

See Propan-2-ol (Ipa)

Lactic acid

See DL-2-Hydroxypropanoic acid

Lactose (Bacteriological)

CAS No: 10039-26-6
EEC No: 200-559-2
E8R04090 500g **£14.95**

Laevulose

See D-(+) Fructose

Lauroyl Peroxide

See Di (Dodecanoyl) Peroxide

Lead(II) acetate 3-water



Alternative Description: Lead(II) ethanoate
Formula: $(\text{CH}_3\text{COO})_2\text{Pb} \cdot 3\text{H}_2\text{O}$
M.W. 379.33
CAS No: 6080-56-4
EEC No: 206-104-4
Danger
Hazard: H360Df, H373, H410
Precaution: P201, P273, P308+P313, P501

E8A68699 500g **£24.95**

Lead(II) bromide



Formula: PbBr_2
M.W. 367.01
CAS No: 10031-22-8
EEC No: 233-084-4
Danger
Hazard: H360Df, H332, H302, H373, H410, H360
Precaution: P201, P273, P308+P313, P501

E8A68706 250g **£25.95**

Lead(II) carbonate (basic)



Formula: $\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$
CAS No: 1319-46-6
EEC No: 215-290-6
Danger
Hazard: H360Df, H332, H302, H373, H410
Precaution: P201, P273, P308+P313, P501

E8A68718 500g **£29.95**

Lead(II) chloride



Formula: PbCl_2
M.W. 278.11
CAS No: 7758-95-4
EEC No: 231-845-5
Danger
Hazard: H360Df, H332, H302, H373, H410
Precaution: P201, P273, P308+P313, P501

E8A68729 100g **£12.95**

Lead(II) ethanoate

See Lead(II) acetate

Lead foil



Formula: Pb
M.W. 207.2
CAS No: 7439-92-1
EEC No: 231-100-4
Danger
Hazard: H302, H332, H360, H373, H410
Precaution: P201, P273, P308+P313, P501

E8A68664 500g **£11.95**

Lead(II) nitrate



Formula: $\text{Pb}(\text{NO}_3)_2$
M.W. 331.21
CAS No: 10099-74-8
EEC No: 233-245-9
Danger
Hazard: H360Df, H302, H332, H272, H373, H410
Precaution: P201, P220, P273, P308+P313, P501

E8A68743 250g **£10.95**
E8A68755 500g **£17.95**

Lead(II) oxide



Alternative Description Lead Monoxide
Formula PbO M.W. 223.20
Risk & Safety phrase numbers R61-20/22-33-62-50/53,
S53-45-60-61
UN Number 2291
UN Class 6.1, III
CAS No 1317-36-8
EEC No 215-267-0

E8A68779 500g **£17.95**

Lead(II) sulfate



Formula: PbSO₄
M.W. 303.26
CAS No: 7446-14-2
EEC No: 231-198-9
Danger
Hazard: H360Df, H332, H302, H373, H410
Precaution: P201, P273, P308+P313, P501

E8A68809 100g **£12.95**

Limewater

Alternative Description: Calcium hydroxide solution
CAS No: 1305-62-0
EEC No: 215-137-3

E8R04776 2.5L **£9.59**

Lithium metal



Formula: Li
M.W. 6.94
Danger
Hazard: H260, H314, EUH014
Precaution: P223, P231+P232, P280, P305+P351+P338,
P310, P370+P378
An export permit is required for this item

E8A68834 10g **£17.95**
E8A68846 25g **£39.95**

Lithium carbonate



Formula: Li₂CO₃
M.W. 73.89
CAS No: 554-13-2
EEC No: 209-062-5
Warning
Hazard: H302, H319, H332
Precaution: P305+P351+P338

E8A68858 100g **£12.95**

Lithium chloride Anhydrous



Formula: LiCl
M.W. 42.39
CAS No: 7447-41-8
EEC No: 231-212-3
Warning
Hazard: H302, H315, H319, H335
Precaution: P261, P305+P351+P338

E8A68869 50g **£7.19**
E8A68871 100g **£8.39**

Litmus

CAS No: 1393-92-6
EEC No: 215-739-6

Litmus granulated

E8A68883 50g **£14.95**

Litmus solution

E8A68895 100mL **£5.69**

E8A68901 500mL **£6.69**

Lugol's Iodine

E8A68913 100mL **£6.29**

Luminol



Alternative Description: 3-Aminophthalhydrazide
CAS No: 521-31-3
EEC No: 208-309-4
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

E8A68925 5g **£48.95**

Lycopodium Powder



CAS No: 8023-70-9
EEC No: 282-002-3
Danger
Hazard: H228
Precaution: P210

E8A68937 25g **£12.95**

L-Tyrosine monohydrochloride

Formula: C₉H₉N₂O₃·HCl
CAS No: 657-27-2
EEC No: 211-519-9

E8A68949 25g **£8.79**

M.M.S.

See Ethanol Mineralised 90% V V (64 Op)

Magnesium



Formula: Mg
M.W. 24.31
CAS No: 7439-95-4
EEC No: 231-104-6
Danger
Hazard: H260, H250
Precaution: P222, P223, P231+P232, P370+P378

Magnesium metal turnings

E8A68974 100g **£6.69**

E8F77613 250g **£12.95**

Magnesium powder

E8A68950 100g **£7.59**

E8R04094 500g **£23.95**

Magnesium ribbon

E8A68962 25g **£4.09**

Magnesium carbonate

Magnesium carbonate (basic) heavy

E8A68986 500g **£14.95**

Magnesium carbonate (basic) light

E8A68998 250g **£10.95**

Magnesium chloride-6-water HR

Formula: MgCl₂·6H₂O

M.W. 203.30

E8A69000 500g **£6.29**

Magnesium hydroxide



Formula: Mg(OH)₂
M.W. 58.32
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

E8A69012 100g **£10.95**

Magnesium nitrate-6-water



Formula: Mg(NO₃)₂·6H₂O
M.W. 256.41
CAS No: 13446-18-9
EEC No: 233-826-6
Warning
Hazard: H319
Precaution: P305+P351+P338

E8A69024 250g **£8.19**

E8R04093 500g **£14.95**

Magnesium oxide

Formula: MgO
M.W. 40.30

CAS No: 1309-48-4

EEC No: 215-171-9

Magnesium oxide heavy

E8A69048 250g **£10.95**

Magnesium oxide light

E8F77637 250g **£8.79**

Magnesium sulfate

Formula: MgSO₄·H₂O

M.W. 246.47

CAS No: 7487-88-9

EEC No: 231-298-2

Magnesium sulfate dried HR

E8A69061 500g **£9.95**

Magnesium sulfate-7-water HR

E8A69059 1kg **£6.29**

DL-Malic acid

See DL-2-Hydroxybutanedioic acid

Malonic acid

See Propanedioic acid

Maltose

Formula: $C_{12}H_{22}O_{11} \cdot H_2O$
 M.W. 360.31
 CAS No: 6363-53-7
 EEC No: 200-716-5

EBA6908525g **£4.39****Manganese(II) carbonate**

Formula: $MnCO_3$
 M.W. 114.95
 CAS No: 598-62-9
 EEC No: 209-942-9

EBA69097250g **£19.95****Manganese(II) chloride-4-water**

Alternative Description: Manganous chloride
 Formula: $MnCl_2 \cdot 4H_2O$
 CAS No: 13446-34-9
 EEC No: 231-869-6
 Warning
 Hazard: H302

EBA69103250g **£23.95****Manganese(II) sulfate-1-water**

Alternative Description: Manganous sulfate
 Formula: $MnSO_4 \cdot H_2O$
 M.W. 169.01
 CAS No: 10034-96-5
 EEC No: 232-089-9
 Warning
 Hazard: H373, H411
 Precaution: P273

EBA69140250g **£19.95****Manganese(IV) oxide**

Alternative Description: Manganese dioxide
 Formula: MnO_2
 M.W. 86.94
 CAS No: 1313-13-9
 EEC No: 215-202-6
 Warning
 Hazard: H332, H302

EBA69115100g **£4.99****EBA69127**250g **£8.19****D(+)-Mannose**

Formula: $C_6H_{12}O_6$
 M.W. 180.16

EBA691525g **£10.95****Marble Chippings**

Formula: $CaCO_3$
 CAS No: 471-34-1
 EEC No: 207-439-9

Marble chippings 4-6mm
E8G538463kg **£10.95****Marble chippings 9-12mm**
EBA69188500g **£3.59****EBA69199**3kg **£9.59****Mercury**

Formula: Hg
 M.W. 200.59
 CAS No: 7439-97-6
 EEC No: 231-106-7

Danger

Hazard: H330, H360FD, H372, H410

Precaution: P201, P260, P273, P284, P310, P501

EBA69206500g **£52.95****Mercury(II) chloride**

Alternative Description: Mercuric chloride
 Formula: $HgCl_2$
 M.W. 271.50
 CAS No: 7487-94-7
 EEC No: 231-290-8

Danger

Hazard: H341, H361F, H300, H372, H314, H400

Precaution: P264, P273, P280, P305+P351+P338, P310, P501

EBA6923150g **£12.95****Mercury(II) oxide red**

Alternative Description: Mercuric oxide
 Formula: HgO
 M.W. 216.59
 CAS No: 21908-53-2
 EEC No: 244-654-7

Danger

Hazard: H330, H310, H300, H373, H410

Precaution: P260, P264, P273, P280, P284, P302+P350

EBA6925550g **£22.95****Methanol 40%**

Alternative Description: Formaldehyde
 Formula: $HCHO$
 M.W. 30.03
 Flash Point: 62°C
 CAS No: 50-00-0
 EEC No: 200-001-8

Danger

Hazard: H330, H301+H311, H314, H317, H335, H351, H370

Precaution: P280, P301+P330+P331, P302+P352, P304+P340, P305+P351+P338, P309+P310

E8F771192.5L **£15.95****Methanoic acid**

See Formic acid 90%

Methanol

Alternative Description: Methyl alcohol
 Formula: CH_3OH
 M.W. 32.04
 Flash Point: 11°C
 CAS No: 67-56-1
 EEC No: 200-659-6

Danger

Hazard: H225, H311, H311, H301+H370

Precaution: P210, P260, P280, PP301+P310, P307+P317

EBA692791L **£4.99****E8F77741**2.5L **£24.95****Methyl acetate**

Alternative Description: Methyl ethanoate
 Formula: CH_3COOCH_3
 M.W. 74.08
 Flash Point: -9°C
 CAS No: 79-20-9
 EEC No: 201-185-2

Danger

Hazard: H225, H319, H336, EUH066

Precaution: P210, P261, P305+P351+P338

EBA69292500mL **£16.95****Methyl alcohol**

See Methanol

Methyl benzoate

Formula: $C_6H_5COOCH_3$
 M.W. 136.15
 Flash Point: 83°C
 CAS No: 93-58-3
 EEC No: 202-259-7

Warning

Hazard: H302, H319

Precaution: P305+P351+P338

EBA69310100mL **£9.59****Methyl cellulose low substitution**

CAS No: 9004-67-5

EBA6934650g **£9.95****Methyl ethanoate**

See Methyl acetate

Methyl Ethyl ketone

See Butanone

Methyl methacrylate

See Methyl 2-methylpropenoate

Methyl 2-methylpropenoate

Alternative Description: Methyl methacrylate
 Formula: $CH_2=C(CH_3)COOCH_3$
 M.W. 100.12
 Flash Point: 11°C
 CAS No: 80-62-6
 EEC No: 201-297-1

Danger

Hazard: H225, H335, H315, H317
 Precaution: P210, P261, P280**EBA69401**250mL **£17.95**

Methyl orange



CAS No: 547-58-0

EBA69413

25g **£8.39**

Methyl orange - xylene cyanol

See Methyl Orange Solution (Screened)

Methyl orange solution

Flash Point: 37°C

CAS No: 547-58-0

EBA69425

100mL **£13.19**

E8F77807

500mL **£7.59**

Methyl orange solution screened

Alternative Description: Methyl orange - xylene cyanol

Flash Point: 37°C

CAS No: 547-58-0

EBA69449

100mL **£4.99**

E8F77819

500mL **£9.95**

Methyl red solution



Formula: $C_{23}H_{19}N_3O_2$

EBA69486

100mL **£4.39**

E8R04099

500mL **£7.89**

Methylated spirits

See Ethanol Mineralised 90% v/v (64 OP)

Methylbenzene



Alternative Description: Toluene

Formula: $C_6H_5CH_3$

M.W. 92.14

Flash Point: 6°C

CAS No: 108-88-3

EEC No: 203-625-9

Danger

Hazard: H225, H361D, H304, H373, H315, H336

Precaution: P210, P261, P281, P301+P310, P331

EBA69309

500mL **£7.19**

E8F80521

2.5L **£17.95**

Methylene blue



Formula: $C_{16}H_{18}ClN_3S$

M.W. 319.85

CAS No: 61-73-4

EEC No: 200-515-2

Warning

Hazard: H302, H315, H319, H335

Precaution: P201, P305+P351+P338

E8F68697

5g **£3.79**

E8R04100

25g **£12.95**

Methylene blue 1% aqueous

EBA69371

100mL **£3.69**

EBA69383

250mL **£9.59**

Methylene blue alcoholic (conc)



Danger

Hazard: H225, H319, H335

Precaution: P210, P260

EBA69369

100mL **£5.99**

Methylene chloride

See Dichloromethane

2-Methylpropan-1-ol



Alternative Description: Isobutyl alcohol

Formula: $(CH_3)_2CHCH_2OH$

M.W. 74.12

CAS No: 78-83-1

EEC No: 201-148-0

Danger

Hazard: H226, H335, H315, H318, H336

Precaution: P261, P280, P305+P351+P338

EBA69462

500mL **£8.79**

2-Methylpropan-2-ol



Alternative Description: tert-butyl alcohol

Formula: $(CH_3)_3COH$

M.W. 74.12

Flash Point: 11°C

EEC No: 200-889-7

Danger

Hazard: H225, H332, H319, H335

Precaution: P210

EBA69474

500mL **£10.95**

Mineral Wool



(Rocksil)

Melting Point: 600°C

Risk & Safety: H315, P280

EBA61797

500g **£7.59**

Mordant black 11

See Eriochrome black T

Naphthalene powder



Formula: $C_{10}H_8$

M.W. 128.17

Flash Point: 79°C

CAS No: 91-20-3

EEC No: 202-049-5

Warning

Hazard: H351, H302, H410

Precaution: P273, P281, P501

E8F77881

500g **£21.95**

n-butyl alcohol

See Butan-1-ol

n-butyl bromide

See 1-Bromobutane

n-butyl iodide

See 1-Iodobutane

n-butyl-chloride

See 1-Chlorobutane

Nickel(II) carbonate (basic)



Formula: $NiCO_3 \cdot 2Ni(OH)_2 \cdot 4H_2O$

M.W. 376.23

CAS No: 39380-74-0

EEC No: 222-068-2

Danger

Hazard: H302, H315, H317, H332, H334, H341, H350i,

H360D, H372, H410

Precaution: P201, P261, P273, P280, P308+P313, P501

EBA69553

100g **£18.95**

Nickel(II) chloride 6-water



Alternative Description: Nickel chloride

Formula: $NiCl_2 \cdot 6H_2O$

M.W. 237.69

CAS No: 7791-20-0

EEC No: 231-743-0

Danger

Hazard: H350i, H341, H360FD, H331, H301, H372,

H315, H334, H317, H410

Precaution: P201, P261, P273, P280, P301+P310, P311

EBA69565

250g **£24.95**

Nickel(II) sulfate



Formula: $NiSO_4 \cdot 6 \cdot 7H_2O$

CAS No: 10101-97-0

EEC No: 232-104-9

Danger

Hazard: H302, H315, H317, H332, H334, H341, H350i,

H360D, H372, H410

Precaution: P201, P261, P273, P280, P308+P313, P501

EBA69590

250g **£10.95**

Nickel Chloride

See Nickel (II) Chloride-6H₂O

Nickel foil

0.15mm approx

CAS No: 7440-02-0

EEC No: 231-111-4

EBA69539

100g **£36.95**

Ninhydrin (Indanetrione hydrate)



Alternative Description: 2,2-Dihydroxy-1,3-dioxohydindene

Formula: $C_9H_6O_4$

M.W. 178.14

CAS No: 485-47-2

EEC No: 207-618-1

Warning

Hazard: H302, H315, H319, H335

Precaution: P261, P305+P351+P338

EBA69607

5g **£10.95**

Nitric acid



Formula: HNO_3

M.W. 63.01

Danger

Hazard: H272, H314

Precaution: P220, P280, P305+P351+P338, P310

Nitric acid 70% w/w

E8F77935

2.5L **£19.95**

E8R04104

4 x 2.5L **£48.95**

Nitric acid 70% w/w AR

E8L19240

1L **£10.95**

Nylon granules

EBA69681

250g **£13.95**

Octadecanoic acid



Alternative Description: Stearic acid
Formula: $\text{C}_{17}\text{H}_{33}\text{O}_2$
M.W. 284.48
CAS No: 57-11-4
EEC No: 200-313-4
Warning
Hazard: H315

EBA69709

250g £19.59

E8R04105

500g £12.95

Octane



Formula: C_8H_{18}
M.W. 114.23
Flash Point: 8°C
CAS No: 111-65-9
EEC No: 203-892-1
Danger
Hazard: H225, H304, H315, H336, H410
Precaution: P210, P231, P303, P310, P331, P501

EBA69711

100mL £18.95

Oil, castor

CAS No: 8001-79-4
EEC No: 232-293-8

EBA69735

500mL £17.95

Oil, immersion (cedarwood)



Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338

EBA69759

50mL £18.99

Oil, olive



Warning
Hazard: H319
Precaution: P305+P351+P338

EBA69760

250mL £9.59

Orcein



CAS No: 64-19-7
EEC No: 200-580-7
Hazard: H314
Precautions: P260, P280, P301, P330, P331, P361, P353, P304, P340, P305, P351, P338

Orcein Acetic Solution

EBA69826

100mL £16.95

Orcein Propionic

EBA69849

100mL £17.95



CAS No: 1400-62-0
EINECS No.: 215-750-6
Hazard: H302
Precaution: P301+P310

Orcein Stain

E8R06013

5g £35.95

Orthophosphoric acid

See Phosphoric acid

Oxalic acid

See Ethanedioic acid-2-water

Paraffin liquid



(medicinal paraffin)
CAS No: 8012-95-1
EEC No: 232-384-2
Warning
Hazard: H319
Precaution: P305+P351+P338

EBA69851

2.5L £22.95

Paraffin oil



(kerosene)
Alternative Description: Kerosene
CAS No: 8008-20-6
Warning
Hazard: H319
Precaution: P305+P351+P338

EBA69772

2.5L £18.95

Pentan-1-ol



Alternative Description: n-Amyl alcohol
Formula: $\text{C}_5\text{H}_{12}\text{O}$
M.W. 88.15
Flash Point: 46°C
CAS No: 71-41-0
EEC No: 200-752-1
Warning
Hazard: H226, H332, H335, H315
Precaution: P261

EBA69875

250mL £10.95

n-Pentane



Formula: C_5H_{12}
M.W. 72.15
Flash Point: -40°C
CAS No: 109-66-0
EEC No: 203-692-4
Danger
Hazard: H225, H304, H336, H411, EUH066
Precaution: P210, P231, P303, P310, P331, P501

E8R04106

500mL £11.95

n-Propyl alcohol

See Propan-1-ol

Pentyl acetate (Pentylethanoate)



Alternative Description: n-Amyl acetate
Flash Point: 23°C
CAS No: 628-63-7
EEC No: 211-047-3
Warning
Hazard: H226, EUH066
Precaution: P210, P243, P280

EBA69887

250mL £7.99

Petroleum ether 40-60°C



Flash Point: -40°C
CAS No: 64742-49-0
EEC No: 265-151-9
Danger
Hazard: H225, H304, H336, H411, EUH066
Precaution: P210, P243, P280, P303, P310, P331, P304+P340, P309+P310

EBA69917

500mL £18.99

E8R04108

2.5L £22.95

Petroleum ether 60-80°C



Flash Point: -20°C
CAS No: 8032-32-4
EEC No: 265-151-9
Danger
Hazard: H225, H304, H315, H336, H411
Precaution: P210, P243, P280, P303, P310+P331, P302+P352, P304+P340, P309+P310

EBA69930

500mL £6.39

Petroleum ether 80-100°C



Flash Point: -10°C
CAS No: 8032-32-4
EEC No: 265-151-9
Danger
Hazard: H225, H304, H315, H336, H411
Precaution: P210, P243, P280, P303, P310+P331, P302+P352, P304+P340, P309+P310

EBA69954

500mL £8.19

Petroleum ether 100-120°C



Flash Point: -10°C
CAS No: 8032-32-4
EEC No: 265-151-9
Danger
Hazard: H225, H304, H315, H336, H411
Precaution: P210, P243, P280, P303, P310+P331, P302+P352, P304+P340, P309+P310

EBA69978

500mL £10.95

E8R04107

2.5L £20.95

Petroleum jelly (white)

EBA70002

500g £6.19

pH buffer solution

pH4 buffer solution Red

E8B59657

1L £6.29

E8B59669

5L £10.95

pH7 buffer solution Yellow

E8B59670

1L £6.29

E8B59682

5L £10.95

pH10 buffer solution Blue

E8B59694

1L £6.29

E8B59700

5L £10.95

Phenol crystals



Formula: $\text{C}_6\text{H}_5\text{OH}$
M.W. 94.11
Flash Point: 79°C
CAS No: 108-95-2
EEC No: 203-632-7

Danger

Hazard: H314, H331, H311, H301, H373, H314
Precaution: P261, P280, P301+P310, P305+P351+P338, P312

EBA70014

250g £21.95

Phenol red 0.02% solution

EEC No: 252-057-8

E8R04109

100mL £4.99

Phenol-fuchsin



Alternative Description: Carbol fuchsin
 Danger
 Hazard: H314, H332, H312, H302
 Precaution: P260, P280, P305+P351+P338
E8A70026 100ml **£9.59**

Phenolphthalein



Formula: $\text{OCOC}_6\text{H}_4(\text{C}_6\text{H}_4\text{OH})_2$
 M.W. 318.33
 CAS No: 77-09-8
 EEC No: 201-004-7
 Danger
 Hazard: H350, H341, H361f
 Precaution: P201, P281, P308+P313
E8A70038 5g **£4.39**
E8F78319 500g **£22.95**

Phenolphthalein solution in ethanol



Flash Point: 24°C
 CAS No: 77-09-8
 Danger
 Hazard: H225, H314, H350
 Precaution: P201, P210, P281, P308+P313
E8L19318 500ml **£3.69**

Phenolphthalein solution



CAS No: 77-09-8
 Danger
 Hazard: H225, H314, H350
 Precaution: P201, P210, P281, P308+P313
E8L19306 100ml **£2.79**

Phenyl 2-hydroxybenzoate



Alternative Description: Phenyl salicylate
 Formula: $\text{C}_6\text{H}_5(\text{OH})\text{COOC}_6\text{H}_5$
 M.W. 214.22
 Warning
 Hazard: H315, H319, H335
 Precaution: P261, P305+P351+P338
E8R04110 100g **£9.79**
E8A70130 250g **£18.95**

Phenyl salicylate

See Phenyl 2-Hydroxybenzoate

DL-Beta-Phenylalanine

Alternative Description: 2-Amino-3-phenylpropionic acid
 CAS No: 614-19-7
E8A70087 5g **£5.99**

DL-Malic acid

See DL-2-Hydroxybutanedioic Acid

Phenylamine



Alternative Description: Aniline
 Formula: $\text{C}_6\text{H}_5\text{NH}_2$
 M.W. 93.13
 Flash Point: 76°C
 CAS No: 62-53-3
 EEC No: 200-539-3
 Danger
 Hazard: H301, H311, H317, H318, H331, H341, H351, H372, H400
 Precaution: P261, P273, P280, P301+P310, P305+P351+P338, P311
E8A70099 250ml **£13.95**

Phenylammonium chloride



Alternative Description: Aniline hydrochloride
 Formula: $\text{C}_6\text{H}_5\text{NH}_2\cdot\text{HCl}$
 Danger
 Hazard: H301, H311, H317, H318, H331, H341, H351, H372, H400
 Precaution: P261, P273, P280, P301+P310, P305+P351+P338, P311
E8A70105 50g **£13.95**

Phenylethene monomer



Alternative Description: Styrene monomer
 Formula: $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$
 M.W. 104.15
 Flash Point: 31°C
 CAS No: 100-42-5
 EEC No: 202-851-5
 Warning
 Hazard: H226, H332, H319, H315
 Precaution: P305+P351+P338
E8A70129 500ml **£15.95**

Phenyl salicylate

See Phenyl-2-hydroxybenzoate

Phloroglucinol 5% alcoholic (acidified)



Alternative Description: Benzene 1,3,5-triol
 Formula: $\text{C}_6\text{H}_3(\text{OH})_3\cdot 2\text{H}_2\text{O}$
 M.W. 162.14
 CAS No: 108-73-6
 EEC No: 203-611-2
 Warning
 Hazard: H314, H361
 Precaution: P281
E8A70166 100ml **£5.39**

Phosphoric acid



Alternative Description: Orthophosphoric acid
 Formula: H_3PO_4
 M.W. 98.00
 CAS No: 7664-38-2
 EEC No: 231-633-2
 Danger
 Hazard: H314
 Precaution: P260, P280, P305+P351+P338

Phosphoric acid

E8A70178 100ml **£7.19**

Phosphoric(V) acid 90% w/w

E8F77996 2.5L **£38.95**

Phosphorus, red



Formula: P
 M.W. 30.97
 Warning
 Hazard: H228, H412
 Precaution: P210, P273
E8A70189 25g **£6.19**

Polythene granules

Alternative Description: Polyethylene
 Flash Point: 221°C
 CAS No: 9002-88-4
E8A70208 250g **£10.95**

Plaster of Paris

See Calcium Sulfate-1/2-water technical

Potassium bicarbonate

See Potassium hydrogen carbonate

Potassium bisulfate

See Potassium hydrogen sulfate

Potassium bromate(V)



Formula: KBrO_3
 M.W. 167.00
 CAS No: 7758-01-2
 EEC No: 231-829-8
 Danger
 Hazard: H271, H350, H301
 Precaution: P201, P301+P310, P308+P313
E8A70233 250g **£27.95**

Potassium bromide



Formula: KBr
 M.W. 119.00
 CAS No: 7758-02-3
 EEC No: 231-830-3
 Warning
 Hazard: H315, H319, H335
 Precaution: P261, P305+P351+P338
E8F78393 500g **£15.95**

Potassium carbonate anhydrous



Formula: K_2CO_3
 M.W. 138.21
 CAS No: 584-08-7
 EEC No: 209-529-3
 Warning
 Hazard: H302, H315, H319, H335
 Precaution: P261, P305+P351+P338
E8F78411 500g **£7.79**

Potassium chlorate(V)



Formula: KClO_3
 M.W. 122.55
 CAS No: 3811 04 9
 EEC No: 223-289-7
 Danger
 Hazard: H271, H332, H302, H411
 Precaution: P220, P273
E8A70269 500g **£30.95**

Potassium chloride

Formula: KCl
 M.W. 74.55
 CAS No: 7447-40-7
 EEC No: 231-211-8
E8F78435 500g **£4.69**
E8A70282 1kg **£12.95**

Potassium chloride AR

E8F78459 500g **£12.95**

Potassium chromate(VI) HR



Formula: K_2CrO_4
 M.W. 194.19
 CAS No: 7789-00-6
 EEC No: 232-140-5
 Danger
 Hazard: H350, H340, H319, H335, H315, H317, H410
 Precaution: P201, P261, P273, P280, P305+P351+P338, P308+P313
E8A70300 250g **£27.95**

Potassium dichromate(VI)



Formula: $K_2Cr_2O_7$
 M.W. 294.18
 CAS No: 7778-50-9
 EEC No: 231-906-6
 Danger
 Hazard: H272, H350, H340, H360FD, H330, H301,
 H372, H312, H314, H334, H317
 Precaution: P201, P220, P260, P273, P280, P284

E8A70312 250g **£11.95**
E8F78502 500g **£23.95**

Potassium dihydrogenphosphate(V)

Alternative Description: Potassium phosphate monobasic
 Formula: KH_2PO_4
 M.W. 136.09
 CAS No: 7778-77-0
 EEC No: 231-913-4

E8A70336 250g **£8.39**

Potassium ethanedioate-I-water



Alternative Description: Potassium oxalate
 Formula: $(COOK)_2 \cdot H_2O$
 M.W. 184.23
 CAS No: 6487-48-5
 EEC No: 209-506-8
 Warning
 Hazard: H302, H312
 Precaution: P280

E8A70348 250g **£21.95**

Potassium ferrocyanide

See Potassium hexacyanoferrate(II)

Potassium hexacyanoferrate(II)-3-water

Alternative Description: Potassium ferrocyanide
 Formula: $K_4Fe(CN)_6 \cdot 3H_2O$
 M.W. 422.39
 CAS No: 14459-95-1
 EEC No: 237-722-2

E8A70359 250g **£11.95**

Potassium hexacyanoferrate(III)

Alternative Description: Potassium ferricyanide
 Formula: $K_3Fe(CN)_6$
 M.W. 329.25
 CAS No: 13746-66-2
 EEC No: 237-323-3

E8A70361 100g **£7.19**
E8A70373 250g **£9.19**

Potassium hydrogen carbonate

Alternative Description: Potassium bicarbonate
 Formula: $KHCO_3$
 M.W. 100.12
 CAS No: 298-14-6
 EEC No: 206-059-0

E8F78551 500g **£7.79**

Potassium hydrogen phthalate AR

Formula: $HOOC-C_6H_4-COOH$
 M.W. 204.22
 CAS No: 877-24-7
 EEC No: 212-889-4

E8F78575 250g **£34.95**

Potassium hydrogen sulfate



Alternative Description: Potassium bisulfate
 Formula: $KHSO_4$
 M.W. 136.16
 CAS No: 7664-93-7
 EEC No: 231-594-1
 Danger
 Hazard: H314, H335
 Precaution: P261, P280, P305+P351+P338, P310

E8A70403 250g **£29.95**

Potassium hydroxide

Formula: KOH
 M.W. 56.11
 CAS No: 1310-58-3
 EEC No: 215-181-3
 Danger
 Hazard: H314
 Precaution: P280, P305+P351+P338, P310

Potassium hydroxide 1.0M



E8L19197 1L **£13.95**

Potassium hydroxide pellets



E8F78599 500g **£11.95**
E8A70427 2kg **£43.95**

Potassium hydroxide pellets AR

E8F78617 500g **£11.95**

Potassium iodate(V)



Formula: KIO_3
 M.W. 214.00
 CAS No: 7758-05-6
 EEC No: 231-831-9
 Danger
 Hazard: H272, H315, H319, H335
 Precaution: P220, P261, P305+P351+P338

E8F78666 100g **£14.95**
E8A70452 250g **£32.95**

Potassium iodate(VII) AR



Alternative Description: Potassium periodate, potassium metaperiodate
 Formula: KIO_4
 M.W. 230.00
 CAS No: 7790-21-8
 EEC No: 232-196-0
 Danger
 Hazard: H272, H315, H319, H335
 Precaution: P220, P261, P304+P351+P338

E8L77446 100g **£17.95**

Potassium iodide

Formula: KI
 M.W. 166.00
 CAS No: 7681-11-0
 EEC No: 231-659-4

E8A70464 100g **£10.95**
E8F78691 500g **£48.95**
E8F78708 1kg **£101.95**

Potassium iodide AR

E8F78719 500g **£51.95**

Potassium manganate

Alternative Description: Potassium permanganate
 Formula: $KMnO_4$
 M.W. 158.03
 CAS No: 7722-64-7
 EEC No: 231-760-3
 Danger
 Hazard: H272, H302, H410
 Precaution: P220, P273, P501

Potassium manganate(VII) 0.02M (0.1N)



E8C06921 2.5L **£19.95**

Potassium manganate(VII) 0.2M



E8A70518 2.5L **£12.95**

Potassium manganate(VII)



E8F78769 500g **£7.39**

Potassium manganate(VII) AR



E8F78770 500g **£10.95**

Potassium peroxodisulfate

See Potassium persulfate

Potassium metal



Formula: K
 M.W. 39.10
 Melting point 63.3°C
 CAS No: 7440-09-7
 EEC No:
 Danger
 Hazard: H260, H314, EUH014
 Precaution: P223, P231+P232, P280, P305+P351+P338, P310, P370+P378

E8A70219 10g **£19.95**
E8A70221 25g **£47.95**

Potassium nitrate



Formula: KNO_3
 CAS No: 7757-79-1
 EEC No: 231-818-8
 Warning
 Hazard: H272
 Precaution: P220

E8A70555 1kg **£5.79**

Potassium oxalate

See Potassium ethanedioate

Potassium periodate, potassium metaperiodate

See Potassium iodate(VII)

Potassium permanganate

See Potassium manganate(VII)

Potassium persulfate



Alternative Description: Potassium peroxodisulfate
Formula: $K_2S_2O_8$
CAS No: 7727-21-1
EEC No: 231-781-8
Danger
Hazard: H272, H302, H319, H335, H315, H334, H317
Precaution: P220, P261, P305+P351+P338, P342+P311
E8A70567 250g **£13.95**

Potassium phosphate monobasic

See Potassium dihydrogen phosphate(V)

Potassium sulphocyanide

See Potassium thiocyanate

Potassium sodium tartrate

Alternative Description: Potassium sodium 2,3-dihydroxybutanedioate-4-water
Formula: $COOK(CHOH)_2COONa \cdot 4H_2O$
M.W. 282.22
E8F78794 500g **£9.19**

Phloroglucinol

See Benzene-1,3,5-triol

Potassium sulfate

Formula: K_2SO_4
M.W. 174.25
CAS No: 7778-80-5
EEC No: 231-915-5
E8A70580 500g **£5.59**

Potassium thiocyanate



Alternative Description: Potassium sulfocyanide
Formula: $KSCN$
M.W. 97.18
CAS No: 333-20-0
EEC No: 206-370-1
Warning
Hazard: H332, H312, H302, H412, EUH032
Precaution: P273, P280
E8A70592 250g **£20.95**
E8R04114 500g **£26.95**

Propan-1-ol



Alternative Description: n-Propyl alcohol
Formula: $CH_3CH_2CH_2OH$
M.W. 60.10
Flash Point: 15°C
CAS No: 71-23-8
EEC No: 200-746-9
Danger
Hazard: H225, H318, H336
Precaution: P210, P261, P280, P305+P351+P338
E8A70671 250ml **£6.99**
E8A70683 500ml **£6.79**
E8F78812 2.5L **£24.95**

Propan-2-ol (IPA)



Alternative Description: Isopropanol, iso-propyl alcohol
Formula: $(CH_3)_2CHOH$
M.W. 60.10
Flash Point: 12°C
CAS No: 67-63-0
EEC No: 200-661-7
Danger
Hazard: H225, H319, H336
Precaution: P210, P261, P305+P351+P338
E8F78836 500ml **£5.19**
E8F78848 2.5L **£19.95**
E8R04115 pack 4 X 2.5L **£62.95**

Propanal



Alternative Description: Propionaldehyde
Formula: CH_3CH_2CHO
M.W. 58.08
Flash Point: -40°C
CAS No: 123-38-6
EEC No: 204-623-0
Danger
Hazard: H225, H319, H335, H315
Precaution: P210, P261, P305+P351+P338
E8R04116 100ml **£9.95**
E8A70610 250ml **£20.95**

Propane-1,2,3-triol



Alternative Description: Glycerol
Formula: $CH_2OHCHOHCH_2OH$
M.W. 92.09
Warning
Hazard: H319
Precaution: P305+P351+P338
E8F77194 500ml **£7.09**
E8F77200 2.5L **£26.95**

Propanedioic acid



Alternative Description: Malonic acid
Formula: $CH_2(COOH)_2$
M.W. 104.06
Flash Point: 157°C
CAS No: 141-82-2
EEC No: 205-503-0
Danger
Hazard: H302, H318
Precaution: P280, P305+P351+P338
E8A70622 25g **£10.95**
E8A70634 100g **£34.95**

Propanoic acid



Alternative Description: Propionic acid
Formula: CH_3CH_2COOH
M.W. 74.08
CAS No: 79-09-4
EEC No: 201-176-3
Danger
Hazard: H314
Precaution: P280, P305+P351+P338, P310
E8A70669 250ml **£22.95**

Propanone



Alternative Description: Acetone
Formula: $(CH_3)_2CO$
M.W. 58.08
Flash Point: -18°C
CAS No: 67-64-1
EEC No: 200-662-2
Danger
Hazard: H225, H319, H336, EUH066
Precaution: P210, P305+P351+P338, P261
E8F75574 2.5L **£14.95**
Propanone HR
E8A70725 1L **£5.59**
Propanone AR
E8F75598 2.5L **£11.95**

Propionaldehyde

See Propanal

n-Propyl alcohol

See Propan-1-ol

Pyridine



Formula: C_5H_5N
M.W. 79.10
Flash Point: 17°C
CAS No: 110-86-1
EEC No: 203-809-9
Danger
Hazard: H225, H332, H312, H302
Precaution: P210, P280
E8R04117 100ml **£12.95**
E8F78885 500ml **£27.95**

Quicklime

See Calcium oxide Tech

Resazurin Tablets

E8A70774 pack 25 **£9.59**
E8F75019 pack 100 **£27.95**

Resorcinol

See Benzene-1, 3-diol

Rock salt

Alternative Description: Sodium chloride
CAS No: 7647-14-5
EEC No: 231-598-3
E8A70798 1kg **£3.69**
E8A70804 10kg **£9.99**

Safranin 1% aqueous

E8A70828 100ml **£5.19**

Safranin O

CAS No: 477-73-6
 EEC No: 207-518-8
 Danger
 Hazard: H318
 Precaution: P280, P305+P351+P338
E8A70816

5g **£3.79****Salicylic acid**

See 2-Hydroxybenzoic acid

Sand

CAS No: 7631-86-9
 EEC No: 231-545-4
 Warning
 Hazard: H373
E8F78964

1kg **£6.29**

Sand, fine white
E8A70841

5kg **£6.59****Schiff's reagent**

E8A70865 500ml **£10.95**

Schultze's solution (chlor-zinc-iodine)

E8A70889 250ml **£15.95**

Sebacoyl chloride 5% in cyclohexane

See Decanedioyl dichloride 5%

sec-Butyl-alcohol

See Butan-2-ol

sec-Butyl-chloride

See 2-Chlorobutane

Silica Gel

CAS No: 7631-86-9
 EEC No: 231-545-4

Self-indicating (Safe option)

E8G72979 500g **£9.69**

Without indicator

E8A70907 500g **£10.95**

Silicon(IV) oxide

Alternative Description: Silicon dioxide
 Formula: SiO₂
 M.W. 60.08
 CAS No: 7631-86-9
 EEC No: 231-545-4
 Warning
 Hazard: H319, H335
 Precaution: P261, P305+P351+P338
E8A70944

250g **£8.19****Silver nitrate**

Formula: AgNO₃
 M.W. 169.87
 CAS No: 7761-88-8
 EEC No: 231-853-9
 Danger
 Hazard: H272, H314, H410
 Precaution: P220, P273, PP280, P305+P351+P338, P310, P501

Silver nitrate 0.1M solution

E8F79014 500ml **£18.95**

E8A71029 2.5L **£64.95**

Silver nitrate 2% solution

E8A71006 500ml **£17.95**

Silver nitrate

E8A70968 25g **£38.95**

E8A70979 50g **£81.95**

E8A70981 100g **£150.95**

Silver nitrate AR

E8F79002 25g **£37.95**

Slaked lime

See Calcium hydroxide Tech

Soap powder, white Castile

E8A71055 1kg **£9.59**

Soap Solution

Danger
 Hazard: H225, H371
 Precaution: P210, P260

Soap solution, Clarke's

E8A71031 2.5L **£10.95**

Soap solution, Wanklyn's

E8A71043 2.5L **£8.59**

Soda lime

CAS No: 8006-28-8
 Danger
 Hazard: H314
 Precaution: P280, P305+P351+P338, P310

Soda lime, granulated

E8A71067 500g **£9.95**

Soda lime, Self-Indicating Granules

3-5mm

E8A71079 500g **£9.49**

Soda Lime for Spirometers

E8L12476 500g **£20.95**

Sodium acetate 3-water

Formula: CH₃COONa.3H₂O
 M.W. 136.08
 CAS No: 6131-90-4
 EEC No: 204-823-8
E8F79051

500g **£7.19****Sodium alginate**

CAS No: 9005-38-3

E8A71122 25g **£4.79**

E8R04118 100g **£14.95**

Sodium benzoate

Formula: C₆H₅COONa
 M.W. 144.11
 CAS No: 532-32-1
 EEC No: 208-534-8

E8L77458 250g **£8.99**

Sodium bromide

Formula: NaBr
 M.W. 102.89
 CAS No: 7647-15-6
 EEC No: 231-599-9

E8A71134 250g **£7.19**

E8A71146 500g **£14.95**

Sodium carbonate

Formula: Na₂CO₃.10H₂O
 M.W. 106.14
 CAS No: 6132-02-1
 EEC No: 207-838-8
 Warning

Hazard: H319
 Precaution: P305+P351+P338

Sodium carbonate 10-water

E8L77586 500g **£4.19**

E8A71171 2kg **£7.39**

Sodium carbonate anhydrous

E8F79130 500g **£3.39**

E8A71169 1kg **£14.95**

Sodium chlorate(V)

Formula: NaClO₃
 M.W. 106.44
 CAS No: 7775-09-9
 EEC No: 231-887-4
 Danger
 Hazard: H271, H302, H411
 Precaution: P220, P273
E8A71195

50g **£5.49****Sodium chloride**

Formula: NaCl
 M.W. 58.44
 CAS No: 7647-14-5
 EEC No: 231-598-3

E8F79189 3kg **£5.39**

E8A71237 10kg **£15.95**

Sodium chloride HR

E8A71201 1kg **£3.79**

Sodium chloride AR

E8F79208 500g **£10.95**

Sodium citrate

See Trisodium Citrate Dihydrate

Sodium dihydrogenphosphate(V) -2-water

Alternative Description: mono-sodium orthophosphate
Formula: $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$
M.W. 156.01
CAS No: 13472-35-0
EEC No: 231-449-2

E8A71262 250g **£9.95**

Sodium disulphite

See Sodium metabisulphite

Sodium ethanedioate

 Alternative Description: Sodium oxalate
Formula: $(\text{COONa})_2$
M.W. 134.00
CAS No: 62-76-0
EEC No: 200-550-3
Warning
Hazard: H312, H302
Precaution: P280

E8A71286 250g **£25.95**

Sodium hydrogen carbonate

Alternative Description: Sodium bicarbonate
Formula: NaHCO_3
M.W. 84.01
CAS No: 144-55-8
EEC No: 205-633-8

Sodium hydrogen carbonate
E8F79579 500g **£2.99**
E8F79580 3kg **£8.99**

Sodium hydrogen carbonate HR
E8A71316 1kg **£6.09**

Sodium hydrogen carbonate AR
E8F79592 500g **£9.39**

Sodium hydrogen phosphate(V)-12-water

Formula: $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$
M.W. 358.14
CAS No: 10039-32-4
EEC No: 231-448-7

E8F79610 500g **£13.95**

Sodium hydroxide

 Formula: NaOH
M.W. 40.00
CAS No: 1310-73-2
EEC No: 215-185-5
Danger
Hazard: H314
Precaution: P280, P305+P351+P338, P310

Sodium hydroxide 0.1M
E8F79786 2.5L **£10.95**

Sodium hydroxide 1.0M
E8L19215 1L **£15.95**

Sodium hydroxide 2.0M AR
E8L19252 1L **£4.79**

Sodium hydroxide 5.0M AR
E8L19264 1L **£5.69**

Sodium hydroxide pearl
E8F80223 500g **£4.19**

Sodium hydroxide pearl - 96% min
E8A71365 1kg **£6.09**

Sodium hydroxide pellets
E8F80179 500g **£5.89**
E8L77598 1kg **£11.95**
E8F80181 3kg **£24.95**

Sodium hydroxide pellets AR
E8F80209 500g **£11.95**

Sodium hypochlorite solution

  Formula: NaOCl
M.W. 74.44
CAS No: 7681-52-9
EEC No: 231-668-3
Danger
Hazard: H314, H400, EUH031
Precaution: P273, P280, P305+P351+P338, P310

E8A71479 1L **£4.89**
E8F79804 2.5L **£10.95**

Sodium iodide

 Formula: NaI
M.W. 149.89
CAS No: 7681-82-5
EEC No: 231-679-3
Warning
Hazard: H315, H319
Precaution: P305+P351+P338

E8A71493 100g **£22.95**

Sodium metabisulphite

  Alternative Description: Sodium disulfite
Formula: $\text{Na}_2\text{S}_2\text{O}_5$
M.W. 190.10
CAS No: 7681-57-4
EEC No: 231-673-0
Danger
Hazard: H302, H318, EUH031
Precaution: P280, P305+P351+P338

E8F79853 500g **£3.89**

Sodium metal

  In liquid paraffin
Formula: Na
M.W. 22.99
CAS No: 7440-23-5
EEC No: 231-132-9
Danger
Hazard: H260, H314, EUH014
Precaution: P223, P231+P232, P280, P305+P351+P338, P310, P370+P378

E8A71092 25g **£7.59**

Sodium nitrite

  Formula: NaNO_2
M.W. 69.00
CAS No: 7632-00-0
EEC No: 231-555-9
Danger
Hazard: H272, H301, H400
Precaution: P220, P273

E8A71535 250g **£3.69**

Sodium oxalate

See Sodium ethanedioate

Sodium peroxodisulfate

See Sodium persulfate

Sodium nitrate

  Formula: NaNO_3
M.W. 84.99
CAS No: 7631-99-4
EEC No: 231-554-3
Warning
Hazard: H272, H302, H315, H319, H335
Precaution: P220, P261, P305+P351+P338

E8F79907 500g **£6.59**
E8A71523 1kg **£9.19**

Sodium persulfate

  Alternative Description: Sodium peroxodisulfate
Formula: $\text{Na}_2\text{S}_2\text{O}_8$
M.W. 238.09
CAS No: 7775-27-1
EEC No: 231-892-1
Danger
Hazard: H272, H302, H315, H317, 319, H334, H335
Precaution: P220, P261, P280, P305+P351+P338, P342+P341

E8A71559 250g **£6.49**

Sodium silicate

  Danger
Hazard: H314, H335
Precaution: P261, P280, P305+P351+P338, P310

Sodium silicate powder
E8A71560 500g **£6.19**

Sodium silicate Tech (water glass)
E8A71572 2.5L **£12.95**

Sodium sulfate anhydrous

Formula: Na_2SO_4
M.W. 142.04
CAS No: 7757-82-6
EEC No: 231-820-9

E8F79993 500g **£3.79**
E8A71614 1kg **£6.99**

Sodium sulfite anhydrous

Formula: Na_2SO_3
M.W. 126.04
CAS No: 7757-82-6
EEC No: 231-820-9

E8F80053 500g **£4.79**

Sodium tauroglycocholate

Alternative Description: Bile salts
E8A71638 25g **£12.95**

Sodium tetraborate(III)-10-water



Alternative Description: Borax, Sodium borate
Formula: $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
M.W. 381.37
CAS No: 1303-96-4
EEC No: 215-540-4
Danger
Hazard: H360FD
Precaution: P201, P308+P313

E8F80077 500g £4.79

Sodium thiosulfate

Sodium thiosulfate 0.1M

E8A71705 2.5L £9.59

E8R04119 5L £17.95

Sodium thiosulfate-5-water

E8F80107 500g £3.59

E8A71675 1kg £6.99

E8F80119 3kg £11.95

Sodium thiosulfate-5-water AR

E8F80132 500g £5.39

Sodium thiosulfate commercial

E8A71699 3kg £16.95

Sodium-2-hydroxybenzoate



Alternative Description: Sodium salicylate
Formula: $\text{HOC}_6\text{H}_4\text{COONa}$
M.W. 160.10
CAS No: 54-21-7
EEC No: 200-198-0
Danger
Hazard: H302, H315, H318, H335
Precaution: P261, P280, P305+P351+P338

E8A71456 250g £12.95

Stannous chloride

See Tin(II) chloride-2-water

L(-) Sorbose

Formula: $\text{C}_6\text{H}_{12}\text{O}_6$

E8A71729 25g £46.95

Starch

CAS No 9005-84-9 EEC No 232-686-0

Starch, potato

E8F80247 500g £6.99

Starch 2% w/v

E8A71766 1L £5.19

Starch, maize

E8A71730 500g £5.79

Starch, soluble

E8A71754 500g £5.29

Stearic acid

See Octadecanoic acid

Steel Wool

E8A71778 454g £8.99

Strontium nitrate anhydrous



Formula: $\text{Sr}(\text{NO}_3)_2$
M.W. 211.63
Warning
Hazard: H272, H302, H315, H319, H335
Precaution: P220, P261, P305+P351+P338

E8A71791 250g £11.95

Styrene

See Phenylethene monomer

Succinic acid

See Butanedioic acid

Sucrose

Formula: $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
M.W. 342.30
CAS No: 57-50-1
EEC No: 200-334-9

E8A71808 1kg £6.29

E8R04120 3kg £16.95

Sudan III

CAS No: 85-86-9
EEC No: 201-638-4
Danger
Hazard: H225, H302, H371
Precaution: P210, P280, P260, P301+P312

E8A71821 10g £5.39

Sudan III 3.6% in alcohol



E8A71833 100mL £4.29

Sulfur



Formula: S
M.W. 32.06
CAS No: 7704-34-9
EEC No: 231-722-6
Warning
Hazard: H228
Precaution: P210

Sulfur flowers

E8A71857 250g £4.69

Sulfur flowers, tech

E8A71870 1kg £12.95

Sulfur resublimed

E8F80260 500g £7.59

Sulfuric acid



Formula: H_2SO_4
M.W. 98.07
CAS No: 7664-93-9
EEC No: 231-639-5
Warning
Hazard: H315, H319
Precaution: P305+P351+P338

Sulfuric acid 0.05M E8A71973 2.5L £9.95

Sulfuric acid 0.5M E8A71961 2.5L £15.95

Sulfuric acid 1.0M AR E8L19227 1L £5.69

Sulfuric acid 2.0M E8A71948 1L £5.39



Danger
Hazard: H314
Precaution: P280, P305+P351+P338, P310

Sulfuric acid 4.0M E8A71936 1L £6.29

Sulfuric acid E8A71900 1L £8.99

Sulfuric acid AR E8L19276 1L £9.95

Talc



CAS No: 14807-96-6
EEC No: 238-877-9
Warning
Hazard: H332

E8F80442 1kg £6.29

Tartaric acid

See (+)2,3-dihydroxybutanedioic acid

T-Butyl alcohol

See 2-methylpropan-2-ol

T-Butyl bromide

See 2-bromo-2-methylpropane

Tetrazolium salt

See 2,3,5-triphenyltetrazolium chloride

Thymol blue

Formula: $\text{C}_{10}\text{H}_{16}\text{O}_5$
M.W. 466.59

E8A72009 5g £5.49

Tin

Tin, granulated

Formula: Sn
M.W. 118.69
CAS No: 7440-31-5
EEC No: 231-141-8

E8A72011 100g £25.95

E8A72023 250g £66.95

Tin, powder



Warning
Hazard: H319, H335
Precaution: P261, P305+P351+P338

E8A72035 100g £30.95

Tin(II) chloride-2-water



Alternative Description: Stannous chloride
Formula: $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$
M.W. 225.63
CAS No: 10025-69-1
EEC No: 231-868-0
Danger
Hazard: H302, H314
Precaution: P280, P305+P351+P338, P310
EBA72047

100g **£9.39**

Toluene

See Methylbenzene

Toluidine Blue

CAS No: 92-31-9

EBA72084

5g **£21.95**

Tri sodium citrate

See Trisodium Citrate Dihydrate

Trichloromethane



Alternative Description: Chloroform
Formula: CHCl_3
M.W. 119.38
CAS No: 67-66-3
EEC No: 200-663-8
Warning
Hazard: H351, H302, H373, H315
Precaution: P281

E8F76396

500ml **£8.19**

E8F76402

2.5L **£30.95**

Trioxoboric(III) acid



Alternative Description: Boric acid
Formula: H_3BO_3
M.W. 61.83
CAS No: 10043-35-3
EEC No: 233-139-2
Danger
Hazard: H360FD
Precaution: P201, P308+P313
E8F76013

500g **£8.19**

2,3,5-Triphenyltetrazolium chloride



Alternative Description: Tetrazolium salt
Formula: $[\text{C}_6\text{H}_5\text{CN}(\text{N}(\text{C}_6\text{H}_5)_2)_2\text{N}]\text{Cl} \cdot \text{H}_2\text{O}$
M.W. 352.82
Warning
Hazard: H315, H319, H335
Precaution: P261, P305+P351+P338
EBA72138

5g **£22.95**

Trisodium Citrate Dihydrate

Alternative Description: Tri-sodium 2-hydroxypropane-1,2,3-tricarboxylate-2-water
Formula: $\text{HO}(\text{COONa})(\text{CH}_2\text{COONa})_2 \cdot 2\text{H}_2\text{O}$
M.W. 294.10
CAS No: 6132-04-3
EEC No: 200-675-3
E8F79233

500g **£5.79**

Universal Indicator



Danger
Hazard: H225
Precaution: P210

Universal Indicator pH 4 to 11

EBA72149

250ml **£6.99**

EBA72151

500ml **£5.49**

EBA72163

1L **£11.95**

Universal indicator (Full range)

E8R04780

2.5L **£34.95**

Colour Chart for pH 4-11 Indicator

E8R05057

each **£1.56**

Urea

Alternative Description: Carbamide
Formula: NH_2CONH_2
M.W. 60.06
CAS No: 57-13-6
EEC No: 200-315-5
E8F80673

500g **£4.79**

Vitamin C

See L-Ascorbic acid

Water, deionised

Formula: H_2O
M.W. 18.02
CAS No: 7732-18-5
EEC No: 231-791-2

EBA72266

2.5L **£9.95**

E8F75422

5L **£5.69**

E8F75434

25L **£14.95**

Wax, white (paraffin),

Melting Point: 46-48°C

E8A72319

500g **£17.95**

Wax, white (beeswax)

E8A72289

500g **£16.95**

White spirit



Flash Point: 42°C
CAS No: 64742-48-9
EEC No: 265-191-7
Danger

Hazard: H304, H340, H350

Precaution: P201, P281, P301+P310, P308+P313, P331

EBA72333

1L **£4.99**

E8R04121

2.5L **£14.95**

Xylene

See Dimethylbenzene

Zinc bromide



Formula: ZnBr_2
M.W. 225.19
CAS No: 7699-45-8
EEC No: 231-718-4

Danger

Hazard: H314, H400

Precaution: P273, P280, P305+P351+P338, P310

E8A72412

100g **£18.95**

Zinc chloride, granular



Formula: ZnCl_2
M.W. 136.29
CAS No: 7646-85-7
EEC No: 231-592-0
Danger

Hazard: H302, H314, H410

Precaution: P273, P280, P305+P351+P338, P310, P501

EBA72436

500g **£7.79**

Zinc

Formula: Zn
M.W. 65.38
CAS No: 7440-66-6
EEC No: 231-175-3

Zinc foil

EBA72357

250g **£12.95**

Zinc - Granulated

EBA72369

250g **£14.95**

Zinc Granulated, tech

E8R04122

500g **£17.95**

EBA72382

1kg **£27.95**

Zinc powder



Danger
Hazard: H260, H250, H410
Precaution: P222, P223, P273, P370+P378

EBA72400

500g **£17.95**

E8L77604

1kg **£35.95**

Zinc nitrate-6-water



Formula: $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
M.W. 297.48
CAS No: 10196-18-6
EEC No: 231-943-8
Danger
Hazard: H272, H302, H315, H319, H335
Precaution: P220, P261, P305+P351+P338

EBA72448

250g **£9.19**

Zinc oxide



Formula: ZnO
M.W. 81.38
CAS No: 1314-13-2
EEC No: 215-222-5
Warning
Hazard: H410
Precaution: P273, P501

EBA72461

500g **£8.39**

Zinc sulfate-7-water



Formula: $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
M.W. 287.54
CAS No: 7446-20-0
EEC No: 231-793-3
Danger
Hazard: H302, H318, H410
Precaution: P273, P280, P305+P351+P338, P309+P310, P501

Zinc sulfate-7-water

E8L77616

250g **£7.19**

E8R05933

1kg **£14.95**

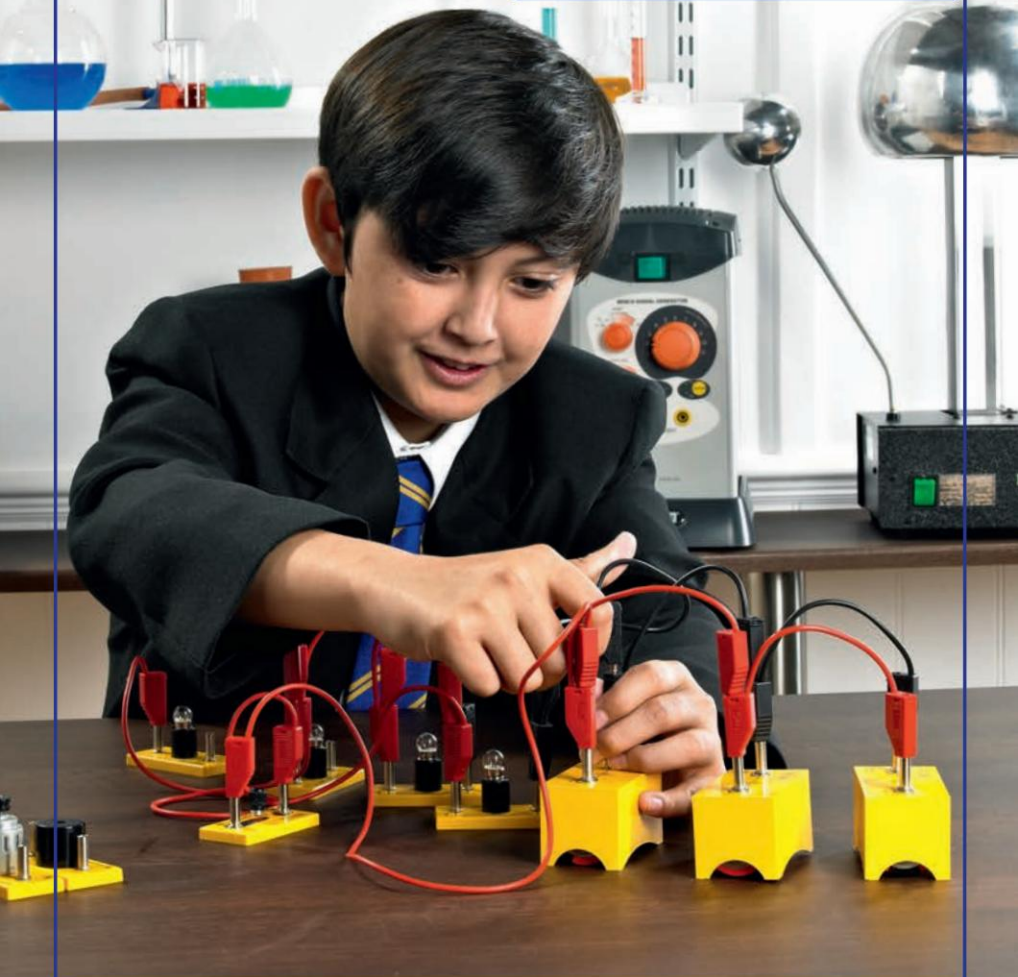
Zinc sulfate-7-water AR

E8F80788

1kg **£18.95**

PHYSICS

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TO ORDER T INT: +44 (0) 115 907 4001 / ROI: 01 427 3100
E exportsales@philipharris.co.uk
www.findel-international.com



Universal Stand

Designed to accommodate the whole range of Teltron tubes and accessories. The base, 240 x 180 x 50mm, and a vertical arm of the stand, 280mm high, are cast in light alloy and stove enamelled.

Three rubber feet ensure maximum stability. Tube mounting jaws are provided, moulded in a material with very high electrical insulation properties. The jaws are split lengthways to admit the side caps of the tubes, and clamps sliding on the jaws lock them securely in position. The jaws, 160mm long x 140mm separation, have an integral hollow boss which

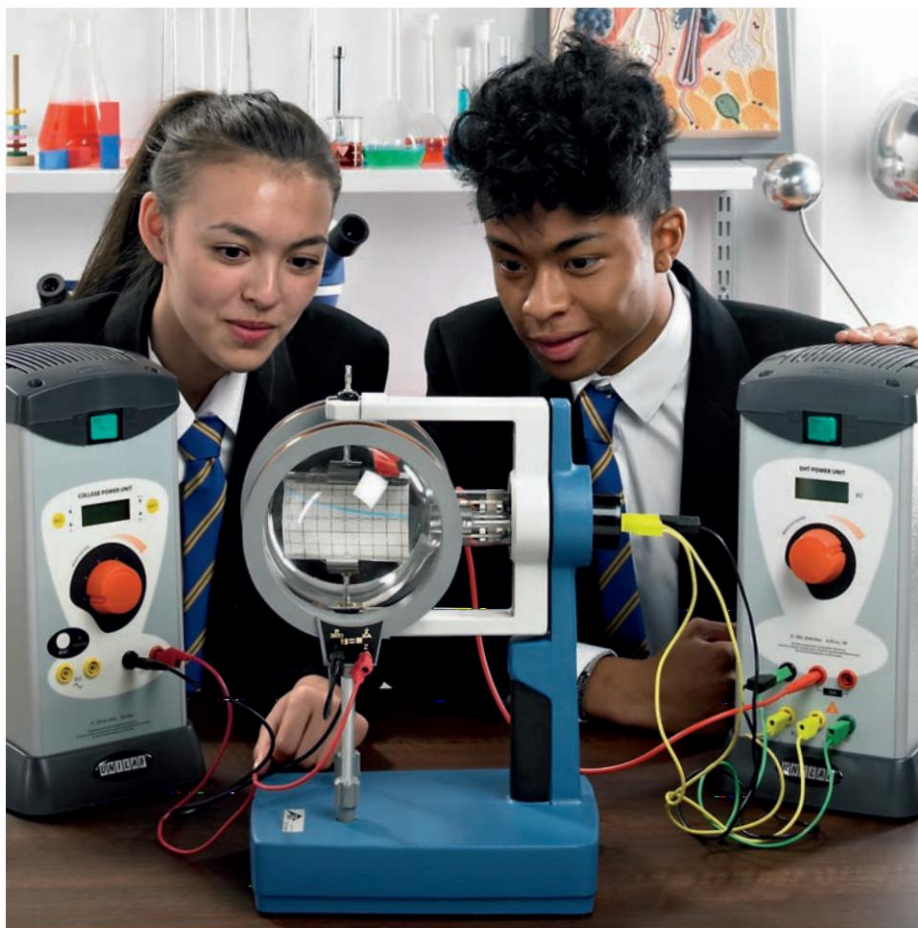
is secured in the stand by a rubber 'O' ring at a centre height of 263mm, permitting a full 360° rotation so that the tube may be displayed to the best advantage. Sockets in the base accommodate the Helmholtz coil supports and locate the coils accurately either side of the tubes. A 4mm earthing socket is drilled into the pillar base. Supplied complete with instructions.

E8A49463

each **£275.95**

CROSS REFERENCE

Easy-Read Meter see page 195



Deflection e/m Tube

For determining e/m by balanced electrostatic deflections or by magnetic deflection using the Helmholtz coils.

Simple electrostatic and magnetic deflection may be demonstrated and the relationships shown between the plate potentials or coil currents and the degree of deflection. The 'electron mirror' effect producing trochoidal spirals is easily shown and also the magnetic focusing at points along the trochoid.

The tube is the standard glass sphere with cylindrical neck and has a diode electron gun with filament and cylindrical anode. In the centre of the sphere and angled at 15° across the axis is a mica screen 90mm long x 60mm high approximately, divided 2 to 10cm along its horizontal axis and 2.0-2cm vertically. The undivided side is coated with phosphor and produces a clear fluorescent trace when irradiated by the electron beam. The top and bottom edges of the mica plate are supported by horizontal metal plates which are connected to 4mm plugs in the side caps and provide the electrostatic deflection field when connected to an E.H.T. supply. Use with the Universal Stand.

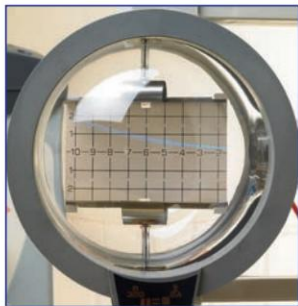
- Maximum filament voltage: 7.5V
- Anode voltage: 1000 to 5000Vdc
- Typical operation: 2000 to 4500V
- Anode current: 0.1mA approx. at 4000V

E8A49530

£655.95

CROSS REFERENCE

4mm Stackable Plug Leads see page 468





A Helmholtz Coils

Connected to a suitable d.c. supply, the coils provide a substantially uniform field in the central space. Each coil has a moulded plastic former 152mm diameter with 320 turns of 22 s.w.g. enamelled wire giving a mean diameter of 136mm. The former is mounted on a boss provided with two 4mm sockets and is fitted with a support rod. The rod has a sliding boss which locks into the tapered hole in the base of the Universal Stand.

Dimensions of coil and support rod 305 x 152 x 25mm. Use with the Universal Stand.

Supplied complete with instructions.

E8A49475

each **£302.95**

B Perrin Tube

The Perrin tube may be used to show that charge can be accumulated in the Faraday pail incorporated, that the charge does not disappear when the filament is switched off and therefore that the cathode rays must consist of charged particles. Electron deflection sensitivity may be measured using Helmholtz coils to deflect the beam. Cathode ray tube operation may also be demonstrated, using a 'secondary coil' for the transverse field. The tube comprises a standard spherical glass body with a cylindrical neck containing a diode electron gun with filament and cylindrical anode, and a Faraday's pail in the sphere, at 45° to the axis. Connections to the diode electron gun are via 4mm sockets in the moulded cap and the Faraday's pail connection is via a 4mm plug in one of the side caps. The end of the sphere has an internal phosphor coating providing a luminescent screen. Use with the Universal Stand.

- Maximum filament voltage: 7.5V.
- Anode voltage: 2000 to 5000V.
- Typical operation at 4000V: anode current 1.8mA beam current 4μA.

Supplied complete with instructions.

E8A49529

each **£520.95**

C Planar Diode

The diode is used to show the basic thermionic effects in vacuum tubes, including:

Current flow between an incandescent filament and a cold electrode (the Edison effect). Determination of e/m by the displacement method using Helmholtz coils.

Characteristic anode current/anode voltage curves for different filament temperatures.

Application of a diode as a rectifier.

The diode consists of a basic glass spherical body with a cylindrical neck, containing a tungsten filament with 4mm connections sockets in the plastic cap on the neck and a circular anode plate connected to a 4mm plug connection on the sphere. Use with the Universal Stand.

- Optimum anode voltage: max 500V
- Maximum anode current: 2.5mA at 300V
- Maximum filament voltage: 7.5V

Supplied complete with instructions.

Direct Delivery - up to 12 weeks

E8A49505

each **£419.95**



**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



Electron Diffraction Tube

The tube uses an electron gun with an indirectly heated cathode to project a narrow converging beam of electrons through a thin layer of graphiticised carbon supported on a fine mesh grid over the exit aperture of the gun. The cathode rays are diffracted in passing through the carbon layer and produce a ring pattern on the phosphor coated end of the tube. Study of the ring pattern and its variation with different anode voltages permits the study and verification of the de Broglie hypothesis, shows the dual nature of the electron, permits the calculation of the spacing of diffracting planes and suggests the probable arrangement of carbon atoms. Use with the Universal Stand.

- Filament voltage: $\approx 7.5\text{V a.c./d.c.}$
- Anode voltage: 2000 to 5000V d.c.
- Anode current: typical 0.15mA at 4000V d.c.

Supplied complete with instructions.

EBA49566

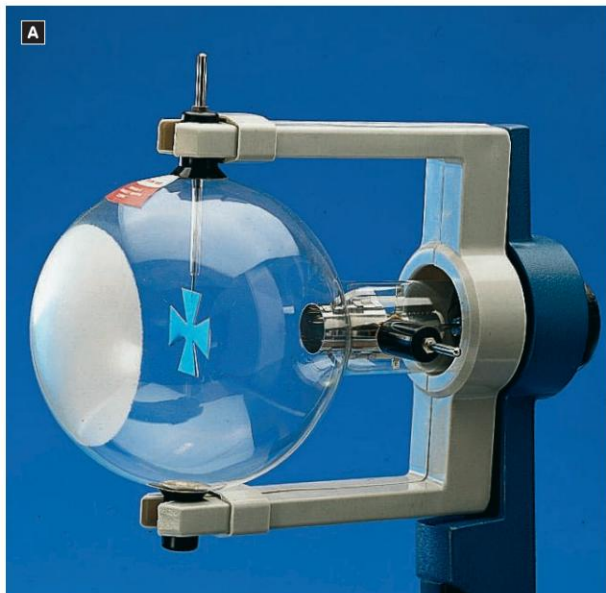
each £725.95



CROSS REFERENCE

Stackable Plugs see page 468

A



A Maltese Cross Tube

For showing the linear propagation of cathode rays, magnetic deflection of cathode rays, image distortion due to electrostatic charging, comparison of cathodic stream and electromagnetic radiation and an introduction to electron optics using a single Helmholtz coil.

The tube comprises the standard spherical glass body with cylindrical neck, a diode electron gun with a filament and cylindrical anode connected to 4mm sockets in the plastic cap, a metal Maltese cross mounted in the centre of the sphere, connected via a 4mm plug in one of the side caps and a phosphor coated screen. Use with the Universal Stand.

- Maximum filament voltage: 7.5V
 - Anode voltage: 2000 to 5000V
 - Anode current: 4000V 1.8mA
- Supplied complete with instructions.

EBA49517

each £462.95

B Double Fine Beam Tube, Gas Filled

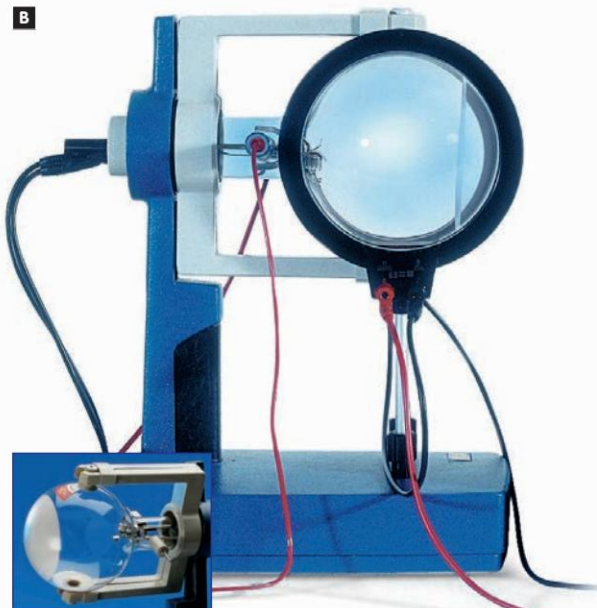
Helium filled, electron beams may be observed throughout the full length of their travel within the tube, a green glow being emitted during the gas/electron collisions. The tangential beam can be deflected by use of Helmholtz coils to produce a completely circular path permitting e/m measurements to be made. Clear free path studies may be made and phenomena such as screen blanking due to charge build up on the screen may be observed. Within the tube are mounted two electron guns with indirectly heated cathodes, the one gun pointing along the axis of the tube, while the other is tangential to the axis, either gun being selected by a switch on the cylinder cap. The angle of projection from the guns is adjustable by means of miniature deflection plates near the gun outlets, a small potential being applied via 4mm connections at the side of the cylindrical neck. The end of the body has a phosphor coated screen for use with the axial gun. Use with the Universal Stand.

- Anode voltage: max 100V d.c.
 - Anode current: max 30mA
 - Filament voltage: max 7.5V a.c./d.c.
 - Deflector voltage: max 50V d.c.
- Supplied complete with instructions.

EBA49554

each £723.95

B



CROSS REFERENCE

EHT Power Supply see page 390



The Protactinium Generator is a convenient way to bring the phenomenon of radioactive decay into the classroom. With a half life of approximately a minute, students have the opportunity to record a complete decay curve in a single lesson.

It presents an ideal opportunity to use a data logger with a radioactive count rate sensor to record the activity, and compare it to a predicted decay curve.

This product is Radioactive, Flammable and Corrosive. Please take the necessary precautions.

Direct Delivery

Protactinium Generator

Protactinium-234 has a half-life of about 70 seconds, and is ideal for the observation of radioactive decay. The isotope is a product of the Uranium-238 decay series.

The generator contains a uranium salt in acidic solution, plus a water-immiscible organic liquid. Pa-234 is soluble in this organic liquid. When the liquids are shaken together, the organic solvent selectively extracts the Pa-234. When allowed to resettle, a physical separation into two layers occurs, any Pa-234 is in the upper organic layer. The Pa-234 decay is monitored by a Geiger tube placed close to the top of the container, supported by a stand and clamp. Over a period of 5 to 10 minutes a clear half-life curve can be captured, manually or using a datalogger. Several factors combine to ensure that Pa-234 clearly exhibits its own half-life.

• Other decay products remain in the lower aqueous layer; alpha and beta radiation from these cannot penetrate the container.

• Pa-234 is a beta emitter with an energy spectrum going up to 2.3 MeV, sufficient to penetrate both the walls of the flask and some of the liquid in which the source is contained.

The generator is supplied in a sealed translucent container, which is virtually chemically inert with a leak-proof closure. This is packed in an outer container which is suitable for long term storage. The generator can be stored for a period of eight years, after which time disposal should be made through a commercial disposal agency or via the local authority. Please note this is a non-returnable item. Only available for delivery to UK mainland addresses.

Data logger and sensor not included.

Direct Delivery – up to 8 weeks

E8R01192

each **£285.95**

Radioactive Sources:

The active material is enclosed in metal foil fixed in a cylindrical mount provided with a stem of 4mm diameter. The foil is further protected from accidental damage by a wire gauze cap over the open 'window' of the mount. The nature and strength of each source is clearly engraved on its mount and it is also colour coded for identification. Each is supplied in a small lead 'castle' in a suitably labelled MDF storage box 100 x 75 x 65mm high. A data sheet is enclosed with each.

A



Practical Information

PURCHASING RADIOACTIVE SOURCES

Letters of Authorisation are NOT required for:

- State schools in England
- Independent schools in England, Wales and Northern Ireland

They ARE required for:

- State schools in Wales, from the Welsh Assembly Government.
- State schools in Northern Ireland from the Department of Education for Northern Ireland (DENI).
- State AND Independent schools in Scotland from the Scottish Government Education Directive.

The mineral specimens do not require any authorisation, but we recommend using the source handling tool. All schools are advised to adhere to the guidance contained in CLEAPSS document L93 'Ionising Radiations and Radioactive Substances', particularly the Standard School Holding in section 3.2

C



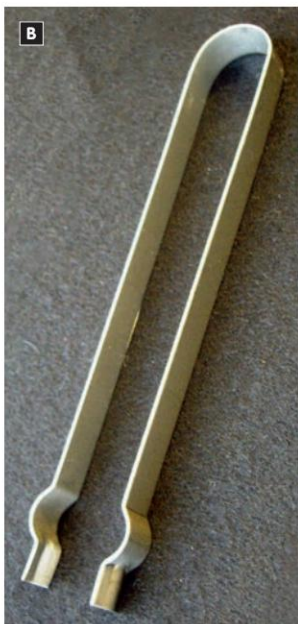
A Radioactive Mineral Specimens

Natural rocks of varied mineral content and radioactivity. Collected from areas as widely separated as Australia, North America and Cornwall. Because of this, the availability of specific rocks varies but the following list is typical of the rocks from which sets are selected: Pitchblende, Allantite, Torbenite, Monazite, Autunite, Davidite, Phosphuranylite. The set comprises four samples that are numbered for easy identification and are packed in a stout cardboard box. Special authorisation is not required by schools in England for this set.

E8A49619

set 4 £24.95

B



B Source Handling Tool

Simple forceps fabricated from a 9.5 x 1.5mm brass strip. The ends are shaped so that a source may be gripped firmly either by its peg or its main body. Overall length: 165mm.

E8A49608

each £9.95

C Radioactive sources

Direct Delivery - up to 6 weeks

Americium-241 kBq

^{241}Am (185 kBq) of Americium-241 incorporated in a silver-palladium disc which transmits a substantial proportion of the alpha particles and a small amount of low energy gamma emission.

- Emissions: α and γ
- Half-life: 458 years
- Colour code: Brown

E8A49591

each £743.95

Strontium-90

^{90}Sr (185 kBq) of Strontium-90 in equilibrium with its daughter nuclide Yttrium-90, incorporated in a silver disc allowing the major proportion of the Beta radiation to escape.

- Emissions: β
- Half-life: 28 years (strontium), 64 hours (yttrium)
- Colour code: Yellow

E8A49578

each £743.95

Cobalt-60

^{60}Co (185 kBq) of Cobalt-60 covered by an aluminium disc to shield beta particles so that only gamma radiation is emitted.

- Emission: γ
- Half-life: 5.26 years
- Colour code: Green

E8A49589

each £743.95

A Experimental Radioactivity Set

This set enables a comprehensive range of experimental investigations into the characteristics and properties of radioactive emission to be carried out. The kit consists of the following items:

- Radioactivity bench with accessories
- Set of absorbers
- Collimator

This experimental set will enable students to investigate the following:

1. To classify radioactive and non-radioactive solids.
2. To investigate the randomness of the radiation emitted by a Radium 226 source.
3. To compare the activity of emitters.
4. To reduce the intensity of radiation emitted by a source.
5. To separate the radiation emitted by a Radium 226 source.
6. To investigate the rate of decay of a radioactive source and to determine the half-life of that decay process.
7. To determine the range of alpha particles in the air.
8. To investigate the absorption of beta particles in a metal.
9. To investigate the attenuation of gamma rays in lead.
10. To investigate the relationship between the intensity of gamma rays at a point and the distance of that point from the source.
11. To monitor the distribution in space of the emission from a radiation source.
12. To investigate the deflection of a stream of beta particles in a magnetic field.
13. To investigate the back scattering of beta radiation by solids.
14. To gauge the thickness of aluminium foil by the transmission of beta particles.
15. To gauge the level of a liquid or powder by the transmission of beta particles.

E8H27143each **£215.95****B Collimator, Simple Pattern**

For use with a standard strontium source to produce a narrow fan-beam of beta particles in order to show deflection of beta particles in a magnetic field.

The collimator has a cylindrical aluminium body 32 x 25mm diameter with a 10mm deep recess in one end to accommodate the head of the source. A nylon screw is provided to lock the source into place. The other end of the body has a 1.5mm slot extending the full width of the body and as far as the source recess.

E8H27129each **£11.95****CROSS REFERENCE**

Logbook Wireless GLE (Including Software)
see page 315



A



A Half Life Analogue

In the study of radioactivity, student practicals are difficult to organise because of the hazardous nature of the topic, but this apparatus offers students the opportunity to obtain realistic results in a perfectly safe way. The student set contains 10 trays and 500 small plastic cubes. The cubes have one face identified and represent radioactive nuclei which have "decayed" when this face is uppermost. Ten groups shake their set of nuclei and roll them out onto the bench. For each throw the decayed nuclei are counted and removed from the set. Excellent results for an exponential decay curve are obtained with increased awareness of the link between activity and the number of nuclei present.

E8G85951

set £75.95

B Geigerteller

A self-contained portable radioactivity detector. Each detected incidence produces an audible click, and a 9V pulse output via 4mm sockets.

Power: internal PP3 battery (not supplied)

Mass: 0.55kg Size: 170 x 95 x 75mm

E8R06098

each £391.95

C Alpha Scattering Apparatus

For demonstrating Rutherford scattering by means of a gravitational analogue of inverse square law repulsion. The apparatus comprises a spun aluminium hill, 280mm diameter x 60mm high, a 12.5mm steel ball and a wooden launching ramp. The shape has been determined by varying its height above the base line by an amount based upon the reciprocal of the radius.

Launching ramp, 300 x 48 x 105mm high with a guide groove down its curved front face and index marks at 40, 60, 80 and 100mm above the base to give a variety of known launching heights.

E8H27179

each £62.95

C

Exclusive



B



CROSS REFERENCE

Protactinium Generator see page 189



A Geiger-Muller Tube Mullard ZP1481

This sensitive GM tube is ideal for detecting α , β and γ radiation and is recommended as a general purpose tube. The GM tube must be used with the GM Tube Holder (see below).

A removable protective mesh cap of plastic is fitted over the window and the body has a thin plastic coating.

- Sensitivity to α , β and γ radiation.
- Threshold voltage (Imax) 370V
- Plateau length (min.) 100V
- Operating temperature -55 to +75°C
- Dead time 100 μ s
- Anode/Cathode capacity 3.5pF
- Sensitivity for 1mR/L radium 1650 counts min⁻¹
- Window thickness 2.5 mg cm⁻²
- Halogen quenched metal tube with thin end window
- Dimensions overall 76 x 26mm diameter

EBA49724

each £413.95

B Geiger-Muller Tube Holder

A cylindrical metal body 63 x 35mm diameter x depth which houses the tube socket and is mounted on a sheet metal stand with resilient rubber-strip feet. A captive co-axial connecting lead 1m long is provided, terminating in a standard BNC connector. A 2.2 M Ω protective stabilising resistor is internally wired in series with the anode connection.

EBH27155

each £113.95



CROSS REFERENCE

Radioactive Sources see page 190



CROSS REFERENCE

BNC to 4mm Socket Adaptor see page 468

A

Redesigned
and
Improved



Our Own Design

B

Ideal For
Further
Education



Suitable for Period and
Frequency Measurement

A S-Range Scaler-Timer

A general purpose scaler-timer suitable for radioactivity counting utilising Geiger-Müller tubes or solid state alpha particle detectors, and as a general purpose millisecond digital timing device with manual or electronic triggering. The bright L.E.D. has six digits, 14mm high, making it suitable for individual use or class demonstration. In the radioactivity mode an integral pre-amplifier is provided for solid state detectors and an adjustable 300 to 500V E.H.T. supply for G.M. tubes. Loudspeaker sockets are also provided for use when an audible indication of count rate is required. In the radioactivity mode, the display features 'most significant figure' blanking. In the timing mode, the display reads in seconds, i.e. from 0 up to 999.999s, and increments in ms. This provides a clean unambiguous display. Timing can be actuated manually or by light operated or mechanical switches and also incorporates triggered timing. Supplies of 2V and 6V a.c. at 0.5A are provided via front panel sockets for optical switch light sources, etc.

- Display: six-digit 14mm bright L.E.D.
- Timing oscillator: 1000Hz (1ms period) $\pm 0.5\%$, typically $\pm 0.2\%$
- Reset: push button
- Radio activity inputs: GM tube via BNC socket with integral 300-500V. supply via directly calibrated rotary control
- Timing inputs: (1) Manually switched start/stop; (2) Light gate operated start/stop; (3) Mechanical switch closure start/stop; (4) Triggered timing start/stop (i.e. momentary interruption of light beam)
- Outputs: 2V and 6V, 0.5A a.c.; Loudspeaker output via 4mm sockets
- Mains supply: 100-120V or 220-240V, 50-60Hz via detachable three-core mains lead with I.E.C. connector and moulded on mains plug (240V version)
- Power consumption: 8W
- Dimensions: W380 x D140 x H165mm

EBH28925

each £517.95

B S-Range Digicounter

A versatile counter suitable for timing, frequency, period and radioactivity measurement. A built-in high stability crystal controlled oscillator ensures a typical accuracy of 0.005% on all measuring ranges. The period measurement and display function enables very low frequencies to be measured rapidly with a high degree of accuracy. It also allows triggered timing of trolley speeds, etc., to be performed using a single light gate, and by shorting the period input, infinite radioactivity or frequency counts may be obtained.

Radioactivity

- Inputs: E.H.T. BNC connector for a G.M. tube. Supply voltage adjustable from 300 to 500V
- Counting time: 1, 10, 100 or 1000 seconds and infinity. Can be set to take a single or a continuous series of readings, each being displayed for 3 seconds before the next is taken
- Rate: Obtained by dividing the count reading by the counting time
- Speaker: output will feed into a speaker of any impedance
- Timing Ranges: 0 to 99.9999 x 0.1ms; 0 to 999.999 x 0.01s (10ms); 0 to 9999.9 x 0.1s (100ms)
- Accuracy: better than 0.005% ± 1 count
- Gating: (1) By manual front panel stop/start switch; (2) By make or break input sockets; (3) By triggering timing stop/start inputs. Output 2V and 6V a.c. at 0.5A for light gate or similar amps

Frequency

- Inputs: (1) Low frequency, d.c. to 3MHz minimum (5MHz typicall). Will operate with T.T.L. inputs, light gates etc.; (2) High frequency, capacitively coupled 30Hz to 3MHz minimum (5MHz typicall); (3) High gain, input voltage required 0.8mV r.m.s. from 30Hz to 20kHz; recommended microphone - high impedance dynamic type
- Input impedance: 20k Ω , inputs 1 and 2, 100k Ω input 3
- Accuracy: Better than 0.005% ± 1 count

Period

- Timing intervals: 0.1, 1, 10 and 100ms

EBH29280

each £743.95

UNILAB®

Planck's constant, symbolised h , relates the energy in one quantum (photon) of electromagnetic radiation to the frequency of that radiation.

Demonstration of photoelectric effect and the principle of applying a "backing p.d." to reduce anode current to zero.



Planck's Constant Kit

- Direct method gives a reasonable order of magnitude value for Planck's constant, h
- Demonstration of photoelectric effect and the principle of applying a backing p.d. to reduce anode current to zero

The Planck's Constant Kit contains a photoelectric unit, with six colour filters and a BNC to 4mm plug lead. The main unit contains a photoemissive Caesium Antimony cathode, with a spectral response of 185-650nm. When light of frequency, f , strikes the cathode, electrons of energy $E_{\text{ph}} = hf$ are released and would normally reach the anode, producing a current which can be registered on a very sensitive instrument such as a Picoammeter or an Electrometer.

The p.d. from an internal PP3 (6F22)-type cell can be adjusted to a value V where the anode current is just reduced to zero. V is proportional to the frequency of light used. This apparatus enables values of V to be found for various frequencies of light selected by placing each of the colour filters in turn over the cell. A plot of V vs. f gives a reasonable straight line where the gradient is h/e .

Items in the kit are available separately, and also a set of three narrow band filters for mercury violet, green and yellow lines from the spectrum of a mercury discharge lamp. These give a similar graph of the same gradient. Contents include one of each of the following (which are available separately):

- Planck's Constant Unit with screened lead
- Colour filters
- Narrow band filter

Plus the following metering:

- Easy-Read Meter
- 20V d.c. attachment
- SpaceSaver Picoammeter

kit £876701

kit £719.95



CROSS REFERENCE

Spacesaver Picoammeter see page 393

Spares and Accessories

Spares and Accessories

Planck's Constant Unit

E8H28615 each £479.95

Colour Filters

Standard colour filters.

E8R05407 pack 6 £100.95

Narrow Band Filters

Recommended for A-level experiments.

E8R05408 pack 3 £47.95

Easy-Read Meter

E8R02652 each £59.95

20V d.c. Attachment

E8H30919 each £17.95



A Planck's Constant Experiment

An interesting way to establish Planck's Constant, the experiment is complete and self-contained, presented in a battery-powered instrument case. A rotary switch selects one of the LEDs, viewable through holes in the sloping front panel. There are five LEDs of wavelengths 430nm, 565nm, 595nm, 620nm and 660nm. By adjusting the potentiometer, the voltage across the selected LED is raised until photon threshold is reached, shown by the LED just beginning to glow. At the threshold it is assumed that all electron energy released in re-combination is converted entirely to photon energy (any higher and photon energy is involved). The voltage across the LED is displayed on the built-in digital voltmeter, from which electron energy (and hence photon energy) can be calculated. Knowing the energy and the characteristic wavelength of the LED indicated on the case, Planck's Constant can be determined. Please note this requires a PP3 battery.

E8H29024

each £136.95

B Ultraviolet Lamp TUV6

A tubular bulb with an E.S. cap. For use on 200-260V a.c. mains supply, no control switch gear required. The principal emission of the bulb is at 253.7nm, giving an energy output of 85mW at this wavelength.

- Nominal mains voltage: 220 V a.c.
- Lowest starting voltage: 170V
- Tube current: 0.027A
- Tube consumption: 6W
- Burning position: All positions
- Dimensions: 150 x 26mm diameter
- Light centre: 92mm from tip of cap

E8R01299

each £137.95

C Ultraviolet Detecting Beads

A fun way to learn about the power of sunlight. As well as making bracelets, pupils are able to carry out fun experiments investigating solar radiation, effectiveness of sunscreen and sunlight. A science activity guide is included and allows children to carry out scientific investigations and learn about the effects of the sun on their health.

- Observe radiation from the Sun at different times of the day
- Test the effectiveness of glass in blocking the Sun's rays
- Test the effectiveness of different SPF sunscreen

A bag of white beads which turn into many different colours when exposed to an ultraviolet light source. Ideal for observing UV radiation from the Sun. Beads are drilled so that they can be threaded onto pipe-cleaners or string. A great way to raise awareness of the health issues associated with exposure to the sun.

Age Suitability: 4 Years +

Direct Delivery – up to 10 days

E8L87567

pack £15.95

D UV Lamp

Portable, ultra violet, black light lamp.

E8R05625

each £12.95

A Magnetic School Resource Kit

An extensive school resource kit.

Includes:

- Set of 12 metal strips and set of 8 metal discs stamped with the name of the metal
- Alnico cast magnets and button magnets, 12, 19 and 24mm
- Set of 10 plotting compasses, 16mm diameter
- Set of 6 marker magnets, 35mm diameter
- Set of 2 ALX III rod magnets, 24 x 8mm diameter
- Set of 2 ALX III bar magnets, 38 x 6 x 6mm
- Set of 5 floating magnets, 24mm diameter
- Packet of coloured magnetic rubber sheets, four colours, 150 x 50mm
- Set of 10 feroba magnets, 50 x 19 x 5mm
- Drum of iron filings, 250g electro magnet
- Pair of steel bar magnets, 75mm
- Pair of alni bar magnets, 75mm, Pair of plastic cased magnets, 8cm
- Pair of alnico bar magnets, 50 x 15 x 10mm
- Piece of lodestone
- Horseshoe magnet set 75, 100 and 125mm in wallet
- Set of 5 Floating magnets on a base
- 4 pieces of soft iron rod, 155 x 19.5mm diameter

EBE46567

kit **£221.95**

B Magnet Kit

A comprehensive kit of magnets and accessories in a compartmented storage case.

Dimensions of case: 320 x 220 x 50mm.

EBA47119

kit **£43.95**

C Bar Magnets, Plastic Coated Ceramic

Particularly suited to younger pupils.

They possess good magnetic strength with very high resistance to demagnetisation, whilst retaining a "traditional" bar magnet appearance by virtue of the red and blue (for N and S) tough plastic casing.

Dimensions: 80 x 22 x 10mm.

EBA46929

pack 2 **£4.69**

D Rectangular Section Magnets, 6% Chrome Steel

In pairs, with keepers.

EBA46875 75mm

pair **£4.79**

EBA46887 100mm

pair **£5.99**

E Magnadur Magnets

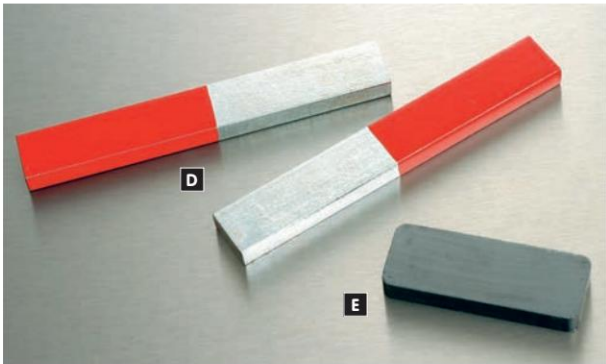
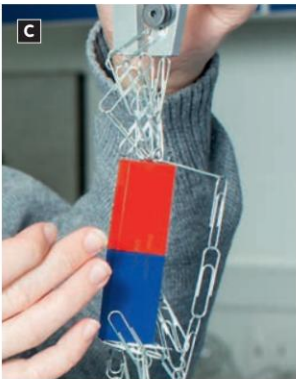
50 x 19 x 6mm, as used in 'Westminster' Electromagnetic Kit.

EBA47156

each **£0.50**

EBR05157

pack 10 **£4.79**

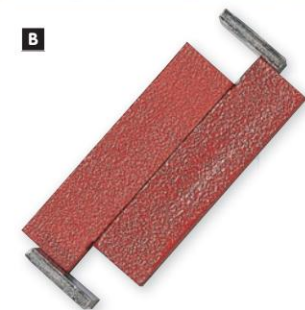




A Stirrup

Brass wire for suspension of magnets or for insulating strips in electrostatics. Length: 50mm. Height: 45mm.

E8H26254 pack 10 **£20.95**



B Alnico Rectangular Magnets

Supplied with keepers.

E8A46930	20 x 10 x 5mm	pair £4.79
E8A46942	40 x 12.5 x 5mm	pair £7.79
E8A46954	50 x 15 x 10mm	pair £11.95
E8A46966	60 x 15 x 5mm	pair £10.95
E8A46978	75 x 15 x 10mm	pair £16.95



C Alcomax Horseshoe Magnets

These magnets in 'Alcomax' have twelve times the magnetic energy of tungsten steel. Pole gap: 23mm. Height: 30mm. Section: 11 x 30mm.

E8A47077 each **£17.95**



D Alcomax Major Magnet

The 'major' magnet in 'Alcomax', is one of the most powerful permanent magnets ever produced and can be adapted to many uses in education, research and industry, such as field plotting, demonstrating moving coil galvanometers, eddy current damping, testing materials for diamagnetism and paramagnetism, magnetic blowouts and especially for the magnetisation of other permanent magnets. Ideal for flux density measurement, magnetising other magnets, demonstration of the moving coil galvanometer and the deflection of beams and particles.

Height 110mm. Width and thickness: 103 x 50mm. Distance between poles: 27mm. Field strength: approx. 0.2 tesla.

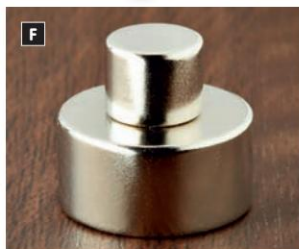
E8A47090 each **£317.95**



E Ceramic Ring Magnet

Annular magnet with face poles (i.e. polarised along cylindrical axis). Internal diameter 32mm, External diameter 72mm, Thickness 10mm.

E8A47179 each **£2.99**



F Neodymium Magnets

Size for size the most powerful magnets to be developed. May be used for many magnetic demonstrations where intense field strength is an important criterion. For example, if a neodymium magnet is dropped down a length of copper plumbing pipe, the eddy currents generated in the copper by the passage of the magnet create a retarding field great enough to noticeably increase the time of fall of the magnet. These face-polarised disc shaped magnets are available in two sizes as follows:

E8A47132	10 x 8mm	each £3.59
E8A47144	20 x 10mm	each £6.59

**BROWSE
OUR ENTIRE
RANGE
ONLINE AT**

www.findel-international.com

**A Coloured Floating Ring Magnets**

Coloured ring magnets which, if placed on the rod supplied and orientated so that they mutually repel, will "float" one above the other. Includes activity cards.

E8A47193

pack 5 £27.95

B Floating Ring Magnets

Demonstrate attraction - and repulsion! Diameter of magnets: 23mm. Overall height of base and rod: 125mm.

E8R06036

each £3.79

C Materials Collection

20 magnetic and non-magnetic materials comprising: iron, steel, aluminium, wood, polythene, brass, rubber, copper, wool, nylon, cork, lead, zinc, carbon, glass, PVC, cotton, cardboard, perspex and nickel.

E8H26266

set £33.95

D Set of Metal Strips

A set of 12 metal strips for magnetism work. Each stamped with a key letter for identification.

E8A47314

set £7.79

E Metal Disc Set

For demonstrating that some metals are magnetic whilst others are not, and for general metal identification exercises. Comprises 16 discs, 25mm diameter, 2 each of mild steel, brass, nickel, silver, bronze, aluminium and copper. One of each pair is stamped with the name of the metal. The other is unmarked.

E8L19161

set £10.95

F Horseshoe Magnets

One each of lengths 75, 100 and 125mm in plastic wallet 6% chrome steel, with keepers.

E8A47223

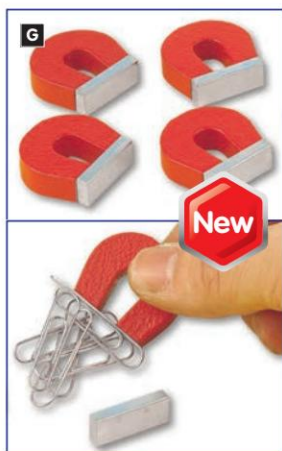
set 3 £21.95

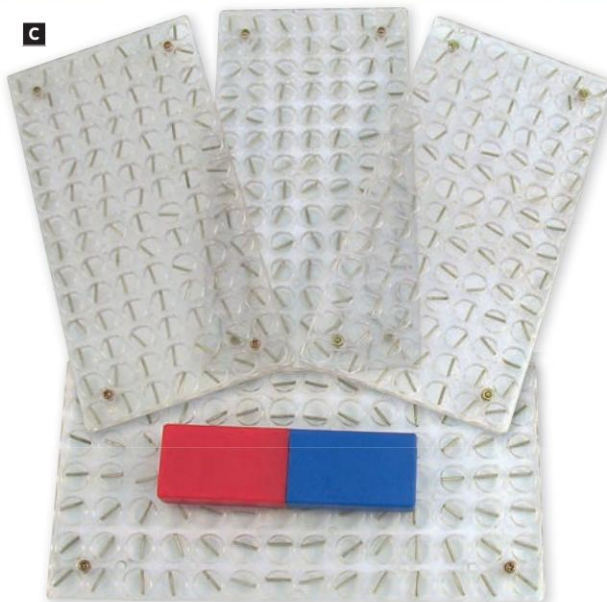
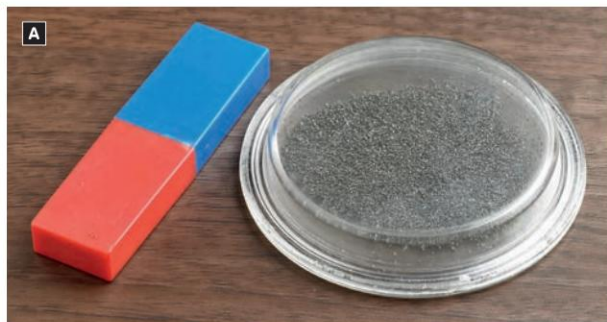
G Small Horseshoe Magnet

Chunky pack of 5 horseshoe magnets measuring 30 x 25 x 7mm and supplied with keeper.

E8R06041

pack 5 £19.95





A Iron Filings Bubble

Suitable for more simple magnetic field plotting experiments in place of loose iron filings. It comprises a shallow, sealed, clear plastic vessel containing a quantity of high quality fine iron filings.

Can be used on an overhead projector for demonstrations. In use, the filings are distributed evenly over the base of the bubble by shaking or tapping. The bubble is then placed over the magnet and gently tapped to permit the filings to align themselves in the magnetic field.

Dimensions: 80 x 12 mm, diameter x depth.

E8A47363

each £1.44

B Iron Filings in Sprinkler Pot

Iron filings pre-packed in cardboard 'sprinkler pots'. Contents of pot: 225g.

E8A47351

pot £2.19

C Magnetic Field Demonstrator

The Magnetic Field Demonstrator comprises a set of four transparent plastic plates 153 x 76 x 6mm. Each plate has a matrix of 98 (14 x 7) small circular chambers, each chamber containing an iron rod and functioning effectively as a plotting compass. The plates may be arranged in various ways, e.g. as a single large two dimensional surface, as faces of a cube etc. and in this way may be used to show configuration of a magnetic field in one or two dimensions. The transparent nature of the plates also make them suitable for use on an overhead projector.

E8A47569

set £49.95

D Soft Iron Rods

200mm long x 12mm diameter.

E8H26291

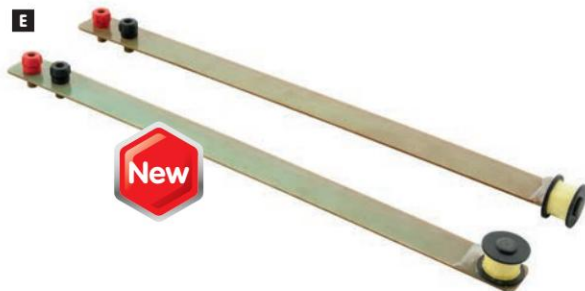
each £3.79

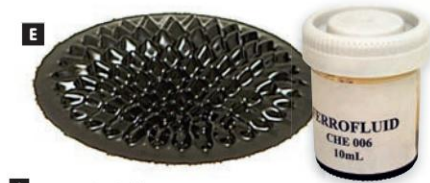
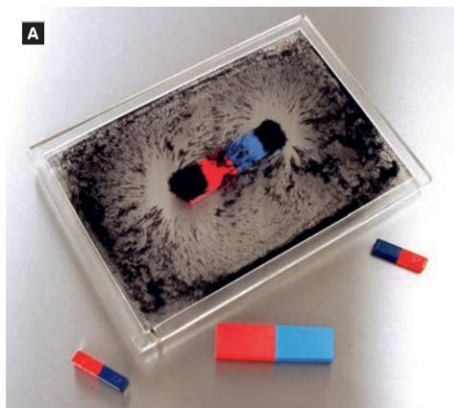
E Axial and Lateral Search Coil

The Search Coil consists of 5000 turns of very fine copper wire on a bobbin fixed at one end of fibreglass board. Electrically insulated and non magnetic end on the other end two 4 mm socket terminals are fitted. It can be used to determine field strengths or flux density inside the air gap of magnets or solenoids. A DC or AC signal can be applied to the search coils to study the effect of interacting magnetic fields. The Axial coil has the coil mounted with its axis parallel to the axis of the PCB board. The Lateral coil has the coil mounted with its axis at 90 degrees to the axis of the PCB board.

EBR06034

each £41.95





A Magnetic Field Frame

For showing magnetic field patterns either on the bench or on an overhead projector. Comprising a shallow transparent chamber, 250 x 180 x 7mm overall, containing iron particles suspended in a liquid. It may be used to show fields in much the same way as with loose iron filings on card but with greater convenience.

The transparent construction allows for demonstration use on OHP, or the device may be placed over a piece of white paper to provide background. Supplied with two pairs of bar magnets and an instruction/experiment booklet.

E8A47375

each £40.95

B Plotting Compass, 16mm

16mm diameter, in a metal case.

E8R01311

pack 10 £4.79

C Plotting Compass 20mm

With needle pivoted between top and bottom glass plates, without dial. Diameter: 20mm.

E8R01312

each £0.60

D Magnetic Rubber Tape

Adhesive-backed magnetic rubber tape, powerful enough to hold light metal objects, can be cut with scissors. Size: 8 x 0.8mm x 10m roll.

E8R06044

each £6.89

E Ferrofluid, 10mL

The amazing Ferrofluid is a truly magnetic liquid that consists of micron size magnetic particles (magnetite) in a mineral oil. Particles are coated in a surfactant which prevents them clumping together.

When a magnet is in close proximity the magnetic particles in the Ferrofluid take up the shape of the magnetic field – a 3D version of the classic iron filings on a piece of paper experiment.

The apparent density of ferrofluid can be changed by applying a magnetic field, e.g. place a one pence piece in a shallow dish (5mm) of ferrofluid and it will sink. Bring a powerful magnet underneath and the coin will float!

Supplied in a plastic jar containing 10mL of Ferrofluid. A rare earth magnet is also supplied.

E8R05624

each £11.95

F Magnaprobe MkII Magnetic Field Indicator

The Magnaprobe™ magnetic field indicator is a small bar magnet fully suspended in a gimbal mounting and is designed to show the three dimensional nature of a magnetic field. The MkII version is designed for work with magnetic fields in a laboratory. A preferable alternative to iron filings or plotting compasses when investigating the fields around magnets or coils etc.

E8A47557

pack 6 £64.95

UNILAB®



Exclusive

Our Own Design

Digital Magnetic Flux Density Unit

- Direct measurement of magnetic field strengths
- Detects and measures the Earth's magnetic field
- Factory calibrated Hall-effect probe
- 0-1V output for connection to data-loggers

This unit measures magnetic field strengths directly up to 2000mT (millitesla). Using a Hall-effect probe mounted on a rotatable ball and socket head, the Digital Magnetic Flux Density Meter can be used to investigate the fields around magnets and coils quantitatively and immediately.

The probe is permanently attached and is factory calibrated to the meter unit. The unit has 3 ranges 0-19.99, 0-199.9, and 0-1999mT selected by a 3 position switch. The LCD has 12mm digits, suitable for demonstration to small groups.

The multi-turn set-zero control can be used to compensate for unwanted background field. On the most sensitive range, the Earth's magnetic field can be measured. As well as displaying the measured field strength on the LCD, a 0-1V output, proportional to the reading, is available at 4mm sockets for connection to a data-logger voltage sensor. Mass: 1.5kg Size: 240 x 135 x 65mm.

Power by mains, with 250mA antisurge fuse.

E8H28729

each £281.95

CROSS REFERENCE

Rectangular Section Magnets, 6% Chrome Steel see page 197





A Magnetising and Demagnetising Coil

Low voltage, suitable for magnetising and demagnetising ordinary magnets, iron bars, strips, etc. Comprises a solenoid wound with insulated copper wire and mounted on a base complete with switch and 4mm terminals.

- Solenoid 250mm long x 35mm internal diameter
- Operating voltage 12V a.c. or d.c. at 6A
- Magnetising by a.c. or d.c.
- Demagnetising by a.c. only

E8H26319

each £71.95

B Electromagnet

Made from 9mm mild steel rod, with overall dimensions of 110 x 60mm. It is wound with 1.6mm enamelled copper wire on plastic bobbins, with small terminal block connectors. An armature is provided. With a current of 5A, a force of 20N is required to separate the armature from the electromagnet. Maximum recommended current is 8A.

E8H26321

each £9.79

C Electromagnetics Power Unit

A power supply specially designed for investigations into magnetic fields associated with electric current and similar experiments, where high current at low voltage is required, and the power supply must tolerate short-circuits.

Dimensions:

Width: 175mm.

Depth: 190mm (including cable clips 206mm).

Height: 298mm.

Mass: 3.4kg.

- Output voltage 1-0-1V a.c. and 2V d.c. at 10A
- Unit tolerates short-circuits
- Transformer protected by a thermal trip and slow-blow fuse
- Internal fan for cool running

E8R01306

each £101.95

D Faradays Law

An assembly supports a coil so that it can be easily slide up and down a support tube and locked in position. When a small cylindrical magnet (supplied) is dropped down the tube, the resultant induced EMF can be monitored with an oscilloscope or data-logger. The amplitude varies with speed and this provides the basis for a student investigation into the relationship between distance fallen by the magnet and the output amplitude. At post-16, equations of motion can be used to determine the speed and if a PC storage oscilloscope is available, there is scope for investigation of output characteristics. Size: H5 x 6 x L38cm.

E8R05978

each £29.95



Westminster Electromagnetic Kit

A comprehensive kit sufficient for 8 students, containing all of the essential apparatus for the basic experiments in electromagnetism. The kit includes special magnets, C-cores, yokes and armatures for constructing the model motor, etc. and caters for the following experiments:

- General investigation of magnets
- Investigation of the magnetic field due to magnets
- Investigation of the magnetic field due to electric current, including simple galvanometers, electromagnets and vibrators
- Forces on currents in magnetic fields including: moving coil ammeter, simple electric motor construction and use, electromagnetic induction- the dynamo
- Alternating current: transformers and power line
- Eddy current and damping
- Force between currents
- a.c. Resonance; back e.m.f. and inductance

Direct Delivery - up to 10 days

E8H26357

pack £413.95

Spares
and
Accessories

White Cotton

Direct Delivery - up to 6 weeks

E8R01314

90m approx. per reel

pack 10 £21.95

Armatures

Moulded, 44 x 30 x 12mm, complete with winding grooves, sockets for index straws and metal bearing tube.

E8H26369

pack 10 £8.39

Mild Steel Yoke - 50mm wide

Direct Delivery - up to 10 days

E8H26370

Mild steel yoke, 50mm.

pack 10 £34.95

Shafts

E8H26412

100 x 2mm diameter approx.

pack 10 £6.59

Copper Wire, Tinned, PVC Covered

Standard 0.6mm solid core equipment wire, to BS4808. 100m length. Green.

Direct Delivery - up to 4 weeks

E8A90929

each £9.59

This range of inductors wound on various types of bobbin are adjusted to within 5% of the stated value and all units are fitted with 4mm sockets.

TRANSFORMER COILS

Practical Information

Turns	Air-core	C-core	Wire Used	Max. Current
60	85 μ H	10mH	1.22mm	1.81A
60+60	350 μ H	15mH	1.22mm	1.81A
120	350 μ H	10mH	0.91mm	1.02A
120+120	1.5mH	60mH	0.91mm	1.02A
1100	20mH	1.0H	0.71mm	0.62A



A Transformer Coils

Silicon steel C-core and clip with a range of coils for use as inductors and transformers. The current ratings are based on 150A per square cm. The coils will run hot, but will not be damaged by short-term currents of up to twice the stated value.

	No. of Turns	each
E8H26436	60 + 60 Turns	£37.95
E8H26448	5000 + 250 Turns	£35.95
E8H26459	500 + 125 Turns	£35.95
E8H26461	1200 + 1200 Turns	£39.95
E8H26473	120 + 120 Turns	£35.95

B Double 'C'-core and Clip

As used in the 'Westminster' Electromagnetic Kit and with coils. Each core is laminated from low loss iron strip to form a roughly rectangular core 90 x 50 x 22mm approximately, with a cross section of 22 x 12mm, and is cut across the middle to produce two equal C's. A strong spring steel clip is provided to hold the two halves together.

Direct Delivery – up to 10 days

E8H76592

set £35.95





A Induction Accessories Set

Comprises a six turn copper coil to show the production of a heavy current at low voltage by the melting of a nail, a solder trough to demonstrate the principle of the induction furnace and a set of aluminium rings to show 'Thomson's rings' effect. Two rings are 'solid', the third split to show that the rings must be continuous for 'levitation' to take place.

E8H26606

set £113.95

B Motor Accessory Set

Lenz's low transformer accessory kit to demonstrate the production of large magnetic fields and Lenz's law damping on pendulums with and without slits.

E8H26618

set £37.95

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



The Eddy Current kit is a great tool to help support teaching and learning within the Magnetism section of the Electricity and Magnetism topic.

A Apparatus to Show Force on a Conductor in a Magnetic Field

Comprising a strong U-shaped magnet and a pair of brass rails with 4mm socket terminals. A brass axle with plastic discs is free to roll along the rails and completes the electrical contact between them. When the axle is placed on the rails between the poles of the magnet, and a power supply unit is connected, the axle is repelled and rolls along the rails away from the centre of the magnetic field.

Dimensions: 175 x 60 x 58mm high.

E8H26629

each **£155.95**

B Eddy Current Kit

For providing a qualitative practical demonstration of Lenz's law. Comprising a copper tube 320 x 15mm $\varnothing$ x dl together with a pair of cylindrical 'plugs'. The plugs are identical in appearance and mass but one is plain steel and one is a powerful neodymium magnet. The time taken to fall is greatly extended as a result of the eddy currents induced in the copper generating a magnetic field which opposes the movement of the magnet. Supplied with a pair of plastic caps to provide self contained storage.

E8F64953

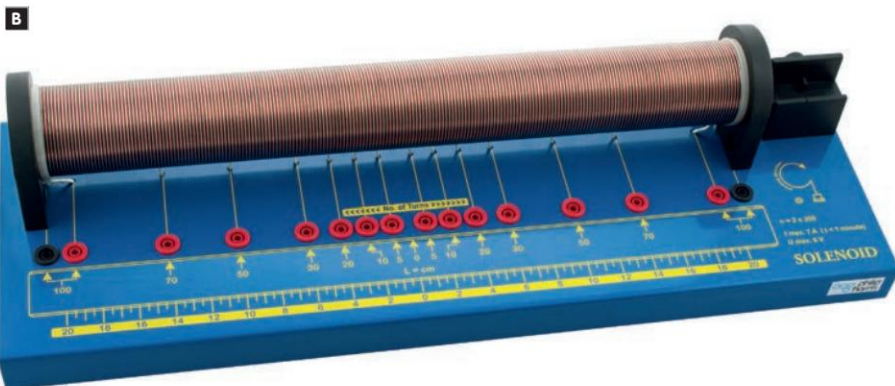
each **£12.95**



CROSS REFERENCE

Bench Power Unit see page 386





A Dissectible Transformer

This apparatus has been designed primarily for demonstration of the basic principles of the a.c. transformer. The various coils and cores will also serve as the basis of many experiments in electromagnetism, using either direct or alternating current.

Contents:

- 1 clamp base
- 1 1200-turn 1A coil
- 1 laminated armature 150 x 40 x 40 mm
- 1 3600-turn 0.3A coil, centre tapped
- 1 300-turn 4A coil
- 1 12000-turn 0.05A coil
- 2 600-turn 2A coils
- 1 laminated 'U' core, length of side 95 mm, Base 150 x 40 x 40 mm

In the basic transformer set all coils are fitted with 4mm socket connectors, but 800 turn coils are available as accessories fitted with a captive mains lead. All coils are of enamelled copper wire wound round on high impact plastic moulded bobbins 75mm long with cheeks 75 x 60mm. The robust clamping base is provided with a tommy-bar screw to hold the 'U' core, and two knurled nuts secure the armature and provide for easy changeover of the coils. Soft iron pieces locate on top of the 'U' core arms.

EBH26564

each £319.95

B Solenoid Superior

This large solenoid offers a range of experiments in the topics of magnetic fields and the transformer effect. Used with a variable d.c. supply and a Magnetic Flux Density meter the field can be measured at various positions inside and outside the coil, for a range of currents.

The solenoid's main coil is of 200 turns, wound on a 50mm diameter tube. The overall length of the windings is 420mm. A second coil is wound on the same tube, with the same overall length. This coil is tapped at 5, 10, 20, 30, 50, 70 and 100 turns on either side of the centre, effectively offering a range of coils from 5 turns to 200 turns. The relationship between flux density, number of turns, current, and length of coil can be fully investigated.

4mm sockets are colour coded to encourage correct connection: black sockets – main 200 turn coil; red sockets – second coil 200 turns; blue sockets – tapings on the second coil.

Used with a variable a.c. supply and suitable a.c. meters (Easy Read meter and 20V a.c. Attachment) students can investigate the behaviour of a crude transformer with and without a core. The two coils are used as primary and secondary windings in various turns ratios. The efficiency is very low. Steel laboratory retort stand rods can be used singly or in small numbers to provide a core for the transformer, to illustrate increasing efficiency.

This introductory work can lead into investigation of practical transformers, e.g. C-cores and Transformer Coils where the complete magnetic path provides much higher efficiency. Students can also extend their study using the Dissectible

Transformer and its accessories, where they can investigate applications of transformer principles to Induction and Motors.

The 'Notes For Use' includes introductory work, with suggestions for extensions.

Maximum voltage: 6V a.c. or d.c.

Maximum current: 7A a.c. or d.c.

Coils: 200 turns 19swg copper wire + 200 turns 19swg tapped

Size: 550 x 155 x 120mm Mass: 1.75kg

EBR03099

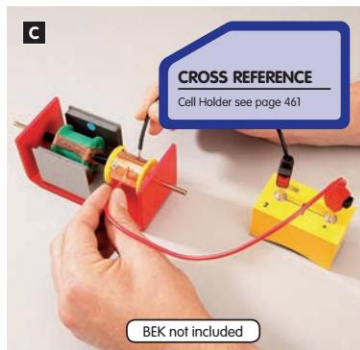
each £112.95

Helpful Hint

Explore the simple ratios using safe, low voltage a.c. from a bench power supply. Use mains input from the mains coil to illustrate the power available when extreme ratios are used in the nail melting experiment.



Redesigned
and
Improved



A Demonstration Electric Motor

A model of the simplest form of d.c. electric motor, having a 2-pole armature wound with enamelled copper wire, and a permanent magnetic field provided by a removable magnet. The construction of the model is completely open and all components are readily observable. A disc-type commutator is incorporated and external connection to the phosphor-bronze bushes is by means of a pair of 4mm sockets. The motor will operate on 3 to 6V d.c. Height: 125mm.

E8L26086

each £52.95

B Demonstration Dynamo

This model uses the same basic assembly as the motor, item D, and is mounted on a baseplate, 200 x 100mm, which also carries a hand-drive pulley, 150mm diameter, coupled to the smaller dynamo pulley by a rubber belt. Electrical output is via a pair of 4mm sockets, and a light emitting diode is provided as simple output indicator. The model may also be used as a motor on a 3 to 8V d.c. supply. Overall height: 180mm.

E8L26098

each £125.95

C Electric Motor Kit

A kit of components and materials that will allow a pupil to build a simple but effective two pole d.c. motor that will run well on voltages as low as 1.5V. This kit is designed to overcome the difficulties of obtaining a good electrical contact with the commutator, with minimum friction, in the brush system. This kit dispenses with the need to construct "permanent" brushes. Instead, the bared ends of two lengths of stranded flexible wire are simply held at either side of the commutator so that they apply gentle pressure under the control of the operator. The ceramic magnets supplied are marked for polarity so that Fleming's rule may be investigated. All materials are provided and a set of teacher's notes is included.

E8A47934

kit £39.95

D Motor Construction Kit

Kit of parts to build six model motors as in the 'Westminster' electromagnet kit. The Motor Construction Kit enables pupils to build their own motors from scratch. By having to construct motors in this way pupils gain a better understanding of the theory behind electric motors.

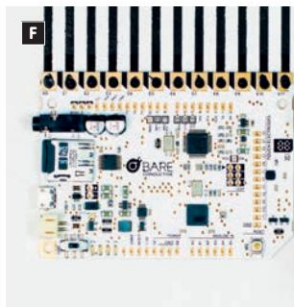
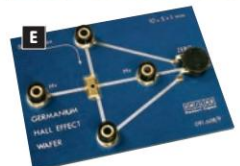
Contents:

- 12 'Magnadur' magnets
- 6 armatures
- 6 mild steel yokes
- 6 support bases
- 6 shafts 4 rivets
- 12 split pins
- 1 reel 0.6mm PVC tinned copper wire
- 2 reels Sellotape
- 300mm tubing, 2.5mm bore

Direct Delivery - up to 10 days

E8H30506

each £112.95



A Class Electricity Pack

Applicable to Year 4 of Key stage 2: Electricity. Includes: 10 x 2AA battery holders, 5 x MES bulb holders, 10 x 2.5V MES bulbs, 5 x red push switches, 3 x SPST toggle switches, 2 x DPDT toggle switches, 2 x reed switches, 2 x lever switches, 5 x electric motors, 1 x 3V buzzer, 5m of red connecting wire, 40 x mini croc clips and a photocopyable 18 page 'Introduction to Electricity' guide.

EBR06043

kit £59.95

B Electric Paint

Electric paint provides a great platform for discovering, laying, repairing and designing with electronics. Electric Paint can be used as both a liquid wire and a conductive adhesive or cold solder. This handy pen allows you to draw circuits and attach small components to your projects. Electric paint is nontoxic, solvent free and water soluble. Works with: Electrical components, prototyping materials, PCBs, microcontrollers (Touch Board™, Arduino, Raspberry Pi, MoKey Makey, LilyPad, FLORA), e-textiles, and conductive thread. Children under the age of 12 must be supervised by an adult whilst using this product.

EBR05973

10ml

each £5.99

EBR05974

50ml

each £17.95

C Philip Harris Economy Electricity Kit

A basic assortment of circuit components including: 10 x MES Lampholders, 10 x MES Bulbs, 6V Buzzer with connecting leads, electric motor, 3-6V, 5 x DPDT slide switch, 3 x 1.5V cell holder and 10 x crocodile leads.

EBL01958

kit £22.95

D Primary Electrics Kit

Over 150 components in a storage box, allowing students to construct circuits. Identify components and investigate different functions. Applicable to Year 4 and 6 of Key stage 2: Electricity. Pack includes 10 x MUR3L 3.5 6 volt motors, 20 x 6 volt MES screw bulbs, 20 x MES button holders, 2 x 6 volt buzzers, 10 x 7.9mm push fit pulleys, 10 x cable ties, 20 x PP3 battery snaps, 10 x (2 x HPIII) battery holders, 10 x (4 HPIII) battery holders, 1 x 100m red multicore wire, 1 x 100m black multicore wire, 20 x double-ended crocodile-clip leads, 5 x 5 amp connector strips, 1 x automatic wire stripper/cutter, 4 x 3mm electrician's screwdrivers, 5 x push-to-make red switches, 5 x push-to-break black switches.

EBR06042

kit £153.95

E Hall Effect Experiment

The semi-conductor germanium, with its high carrier mobility, makes it possible to demonstrate the Hall effect with very simple equipment. The wafer on this board measures 10 x 5 x 1mm and is mounted on a printed circuit panel which allows a magnet to be brought near the wafer surface. A 10k Ω zero balance control is fitted. Two SP2 cells are needed to provide the circulating current and the bar magnet will then produce a Hall voltage which can be read directly on a millivoltmeter. All sockets are 4mm. Nullfield specification 1012. Mass: 0.3kg. Size: 110 x 50 x 23mm.

EBH28389

N-Type

each £239.95

EBH28469

P-Type

each £239.95

F Touch Board™

The Touch Board™ is a tool to make your projects interactive, responsive, smart or just fun. Use the Touch Board™ to change the world around you by turning almost any material or surface into a sensor. Connect anything conductive to one of its 12 electrodes and trigger a sound via its onboard MP3 player, play a MIDI note or do anything else that you might do with an Arduino or Arduino-compatible device. Children under 12 years of age must be supervised by an adult whilst using this product.

EBR06040

each £65.95

G Glowing House Set

The voltage village contains all the materials you need to make two glowing paper houses using electric paint. Our easy step-by-step instructions will show you how to decorate and assemble each house. Draw a circuit with electric paint and attach components. As the light fades your houses will start to glow! Assemble the scenery and create your very own voltage village. Contains: 2 x pre-cut paper houses, 1 x electric paint pen 10ml, LEDs, resistors, LEDs, transistors, battery clip, 9v batteries and sticky dots (gluing required). Children under 12 years of age must be supervised by an adult whilst using this product.

EBR05969

set £21.95

A Basic Electricity Kit (BEK)

The Basic Electricity Kit has been designed as a low-cost, attractive and flexible alternative to the circuit-board approach to pupil investigations into simple circuits. Each component such as a switch, rheostat, bulb holder etc., is mounted on its own individual plastic panel with 4mm sockets. The panels are then formed into circuits by connecting them together using 4mm stackable leads.

Because this is real circuit making, the equipment will find uses throughout secondary school science curriculum. Each kit is supplied in 2 polystyrene trays which keep the units organised.

Contents:

- 12 cell holders (without cells)
- 20 bulb holders
- 40 bulbs (4.5V, 0.3A)
- 12 4mm leads red 100mm
- 12 4mm leads black 100mm
- 4 4mm leads red 250mm
- 4 4mm leads black 250mm
- 4 rheostat units
- 4 universal clips
- 8 crocodile clips
- 4 silicon diodes
- 4 fixed resistors
- 8 push switches
- 4 changeover switches
- 4 electrode holders
- 8 soft iron rods
- 12 carbon rods
- 50m copper wire bare 20swg
- 50g Eureka wire bare 34swg
- 50m insulated copper wire
- 1 sheet copper foil 150 X 150mm
- 1 pack steel wool
- 1 teacher's book
- 2 pupils' books
- 2 polystyrene storage trays

E8L25835kit **£341.95****B BEK Game**

This challenging game has been designed to help students develop and consolidate some of the skills and knowledge found in Science topics: Electricity, Forces & Motion, and Grouping & Classifying materials.

It covers simple circuits, using switches, making bulbs brighter and dimmer, series and parallel circuits, the relationship between circuit diagrams and real circuits. It also deals with electrical conductors and non-conductors, magnetic and non-magnetic materials, forces of attraction and repulsion between magnets.

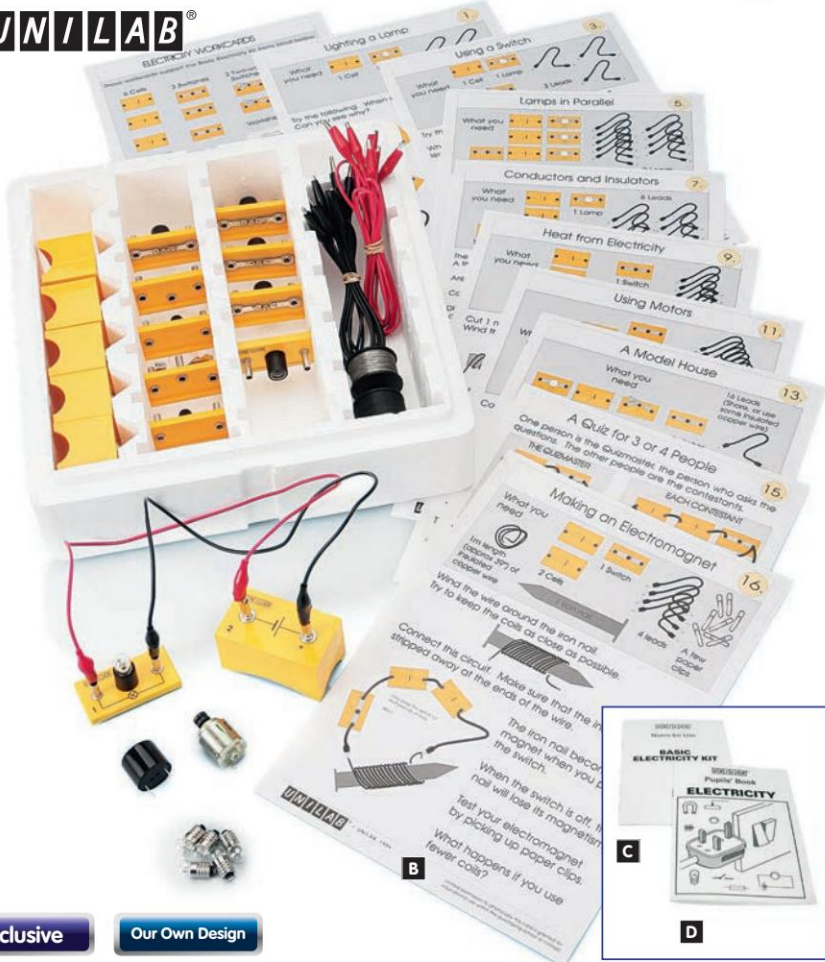
Played individually or in groups, the aim of the game is to collect enough BEK components to make a circuit selected by the teacher. By playing the game and correctly answering questions on the given topics, students gather the components they need. Certain squares on the board offer 'free' components, others ask students to swap with the other players, some prompt the students to make choices. The game requires co-operation, strategy, and negotiation. It provides circuits and questions for different levels of ability, and is an ideal partner for the BEK Primary Electricity Kits A and B. The game comprises: a colourful gameboard, 12 gamecards, 4 sets of 18 question cards, full instructions and answers.

E8L03190each **£56.95****A****Great Value****Great Value****Save**

**Buy the Basic Electricity Kit with the
BEK Game and SAVE**

E8R01207set **£359.95****B**

A UNILAB®



Exclusive

Our Own Design

A Elementary Basic Electricity Kit

An introductory circuit kit for children with workcards covering the following topics: Lighting a lamp, Using motors, Using a switch, A model house, Lamps in series and parallel, Making an electromagnet, Conductors and insulators, A quiz for three or four people and Heat from electricity. Components are mounted on bright yellow plastic bases, each with two 4mm diameter sockets. Contents: six cell holders, six bulb holders, six bulbs, three on/off switches, two two-way switches, buzzer, motor, reel of nichrome wire, ten crocodile leads. Supplied in a robust polystyrene box.

E8L12713

kit £129.95

B Set Of Work Cards For Elementary Electricity Kit

A comprehensive set of sixteen workcards to complement the BEK. They cover lighting a lamp, brightness of a lamp, using a switch, lamps in series, lamps in parallel, lamps and switches, conductors and insulators, heat from electricity, short circuits, using motors, using buzzers, a model house, a model car, making an electromagnet and a fun quiz.

E8C62997

each £18.95

C BEK Teacher's Book

The Teacher's Book gives enough background to help non specialists deliver successful activities at KS 1, 2 and 3.

E8R01321

each £5.99

D BEK Pupils' Book

The Pupils Booklet supports practical work at KS1 and 2 with real world examples and activities.

E8R01322

each £5.99

Innovation

Exclusive

Our Own Design

A fantastic kit to introduce students to electricity! This kit can easily be extended using the individual components on the following pages.



Showing contents of Kit B

Primary Basic Electricity Kit

Designed as a resource for the teaching of introductory electricity, these kits include well structured instructional material and robust components mounted on tough, yellow plastic bases, each with two 4mm sockets. The panels are formed into circuits by connecting them together using 4mm stackable leads. Kit A is for a group of up to six students, while Kit B contains additional items and consumables that could be issued by teachers as required. Only one Kit B would be needed by a class.

A Teacher's Manual is included in Kit A that introduces each item of equipment and a range of tasks and investigations. Topics covered are bulbs and cells, switches, electromagnets, motors and buzzers.

Contents of Kit A:

- 6 cell holders (without cells)
- 6 bulbs in holders
- 3 press switches
- 3 two-way switches
- 18 connecting leads
- Primary Electricity Kit booklet.

Contents of Kit B:

- 20 replacement bulbs
- 4 variable resistors
- 3 motors
- 3 buzzers
- 2 electrode holders
- 3 diodes
- 3 fixed resistors
- 4 universal clips with 8 crocodile clips
- 6 steel rods
- 6 carbon rods
- Reel of plastic-coated wire

Both kits are supplied in a robust polystyrene box.

E8L32049

E8H31304

kit A **£69.95**

kit B **£129.95**

Helpful
Hint

LIGHT A LAMP

Light a lamp using a BEK single cell holder, one BEK lamp, a BEK Switch and two leads. Make the lamp brighter by adding a second cell holder and gently hold the lamp between finger and thumb. What do you feel? Two types of energy are produced by the lamp: heat and light. Use a magnifying glass to look at the filament inside the lamp. The filament is a very thin wire that glows white hot when electricity flows through it. Why don't the connecting wires (leads) get hot?

Our Own Design



A Rheostat (variable resistor)

Vary the current in a circuit using this rheostat. Supplied with 11Ω coil.

E8H30646

each **£11.95**

Rheostat Coil

11 ohms.

E8H30622

each **£2.69**

Rheostat Coil

15 ohms.

E8L01053

each **£3.29**

B Cell Holder

Single cell holder with 4mm sockets, ingeniously moulded so a cell can only be inserted the correct way around. Takes one D cell. For use with either Basic Electricity Kit.

E8R01323

each **£2.79**

C Universal Clip

Holds components and materials for investigation.

E8H30839

each **£3.29**

Mixed Wire Pack

Pack of three wires of diameter 0.14, 0.20 and 0.28mm for investigation of resistivity, to be held in the Universal Clip.

E8H83328

pack 3 **£7.79**

D Bulb Holder

Bulbs sold separately.

E8H30804

each **£2.89**

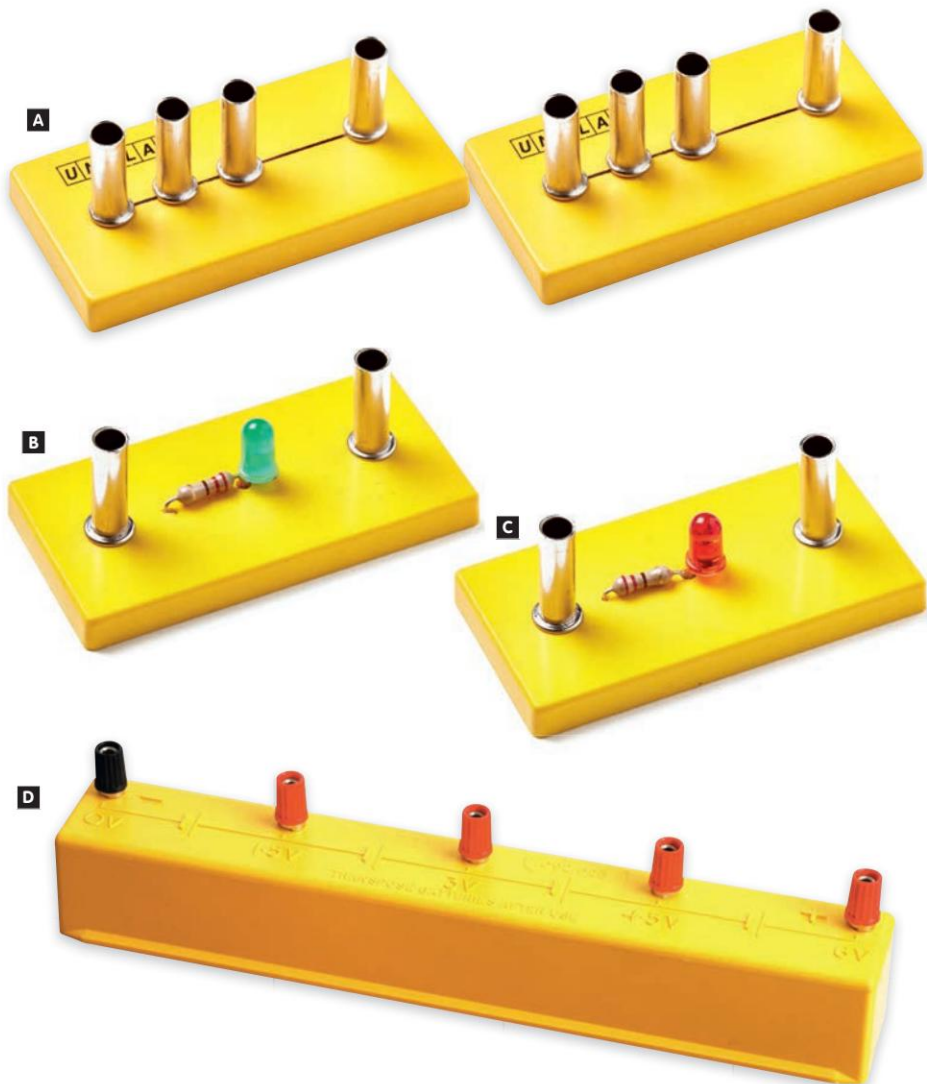
E Push Switch

Push Switch for BEK.

E8H30798

each **£7.39**

Best Seller

**A Parallel Boards**

One pair of parallel boards to use with BEK.
E8R05626

pair **£5.39**

B LED Green

Mounted green LED bulb with 4mm sockets.
E8R05628

each **£2.99**

C LED Red

Mounted red LED bulb with 4mm sockets.
E8R05627

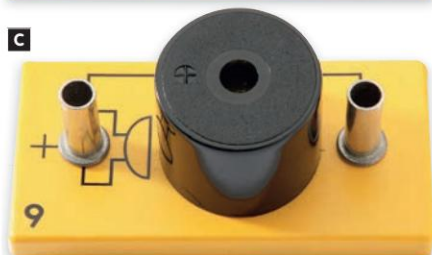
each **£2.99**

D 4 Cell Holder (BEK)

Takes 4 D cells. 4mm sockets enable different voltages to be selected.

E8R01324

each **£17.95**



A Changeover Switch

E8H30828

each **£2.99**

B Mounted Motor

E8H30944

each **£11.95**

C Mounted Buzzer

E8H30749

each **£5.79**

D 3 Way Switch

3 way switch for use with either Basic Electricity Kit.

E8H31286

each **£4.89**

E Flashlamp Bulbs, Round

With M.E.S. cap; suitable for flashlamps, spotlights and panel lamps, etc.

E8R01295

4.5V, 0.3A

pack 10 **£7.19**

F Crocodile Clips

E8H30609

pack 10 **£6.19**

G Carbon Rods

For electrode holder.

E8H31092

pack 10 **£19.95**

Electrode Holder

Electrode holder for use with either Basic Electricity Kit.

E8H79994

each **£4.99**

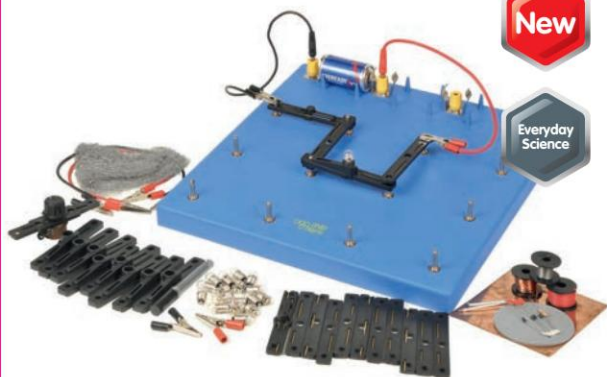
**GLOBAL
DELIVERY AND
AWARD-WINNING
SERVICE**

Spares
and
Accessories**Connectors with Lamp Holder**E8H26813 pack 10 **£23.95****Plain Spring Connectors**E8H26837 pack 10 **£16.95****Connector with Rheostat**E8H26849 each **£15.95****Rectifier**E8H26850 each **£1.44****Resistor**E8H26862 each **£2.89****Circuit Board Only**E8H26953 each **£31.95****Push Button Switches**E8H26904 pack 10 **£41.95****Spare Pegs**E8H26939 pack 10 **£12.95****Advanced Industrial Alkaline Battery**

D, LR20 1.5V

E8R05734 pack 10 **£11.95****Set of Battery Holder Components**

Containing all items required to furnish one board, and comprising three clips, two double contact strips, two single contact strips, four socket terminals (M4 size), nuts and washers.

E8H26941 set **£16.95****A****New**Everyday
Science**B****Exclusive**Economy
Science**A Worcester Circuit Board**

Contains a baseboard with terminal connections, set of high quality plastic connectors with metal inserts and with potentiometer and lamp holders and accessories units, enable a variety of circuits to be constructed quickly. Supplied with all accessories, without cells. Supplied with manual.

E8R06035

each **£155.95**

The following components are supplied with each board:

- 9 Bulb holders
- 1 Bag 16 4.5V Bulbs
- 2 Push-button switches
- 1 Variable resistor (potentiometer)
- 12 Connecting bars
- 1 Resistor
- 1 Coil of wire, 19 gauge copper
- 1 Coil of white wire, 24 gauge copper
- 1 Coil of steel wire, 28 gauge
- 2 Red connecting wires
- 2 Black connecting wires
- 2 Crocodile clips
- 1 Container of graphite rods
- 1 Bag Steel wool
- 1 Instructions

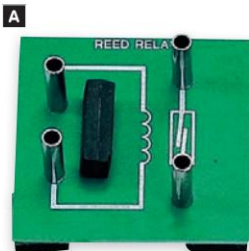
Supplied WITHOUT batteries.

E8H26801

kit **£112.95****B Harris Worcester Circuit Board**

- Rapid assembly of simple circuits
- Wide range of accessories

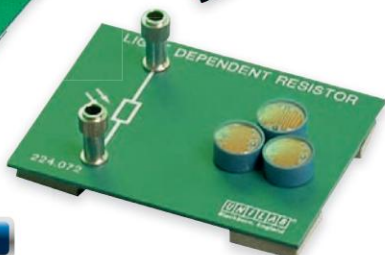
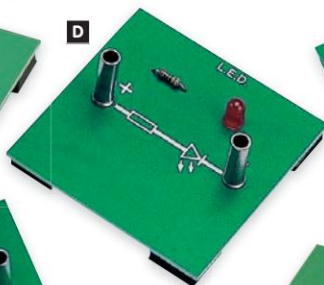
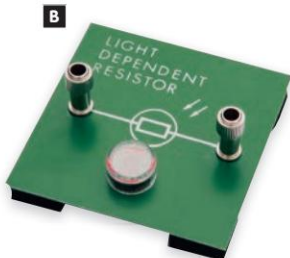
Kit consists of a baseboard, terminals, a set of metal connection pillars and a number of clip-on flexible connection strips and accessory units, allowing a variety of circuits to be constructed quickly and easily. Phosphor-bronze connection strips are designed so that when flexed a little they are easily slipped over the pegs where their natural spring holds them in position and ensures a good electrical contact.



11-13 Simple Circuit Modules

These modules may be used to construct simple circuits of the type normally implemented on, for example, a Worcester Circuit Board. They are intended to introduce younger pupils to some of the more familiar applications of devices and circuits, the main emphasis being on simple electrical circuit work.

The modules are 60 x 60mm and have 4mm plug connections.



Our Own Design

A Reed Relay

A current through the coil produces magnetism to cause the reed to switch another circuit; the reed contacts are protected from short circuit damage by a low-value series resistor.

E8H28147

each £36.95

B Input Boards LDR

An ORP13, 4mm light dependent resistor; fully covered resistance of 10k Ω ; in normal room conditions resistance of 250k Ω approximately.

E8H27702

each £10.95

C Thermistor Unit

A cluster of 5 VAI108s in parallel; resistance approximately 200k Ω at 90°C.

E8H28202

each £12.95

D LED Boards

Large light-emitting diodes with series resistors of 220 Ω for p.d.s up to 6V.

E8H27842 Red LED

each £8.69

E8H28366 Green LED

each £8.99

E Motor

A low-voltage d.c. motor with series resistor to limit current consumption.

E8H27908

each £27.95

Buzzer

A low-current buzzer (approx 2mA).

E8H28019

each £15.95

F Lamp

4.5V, 0.3A bulb in a holder.

E8H27635

each £9.95

G Light Dependent Resistor Unit

A cluster of three ORP12s in parallel; resistance approximately 200k Ω in room lighting to give greater sensitivity and control the current in a reed relay.

E8H28287

each £18.95

H Transistor Board

Based on an NPN TIP47 transistor with 10k Ω base resistor and 100k Ω collector resistor.

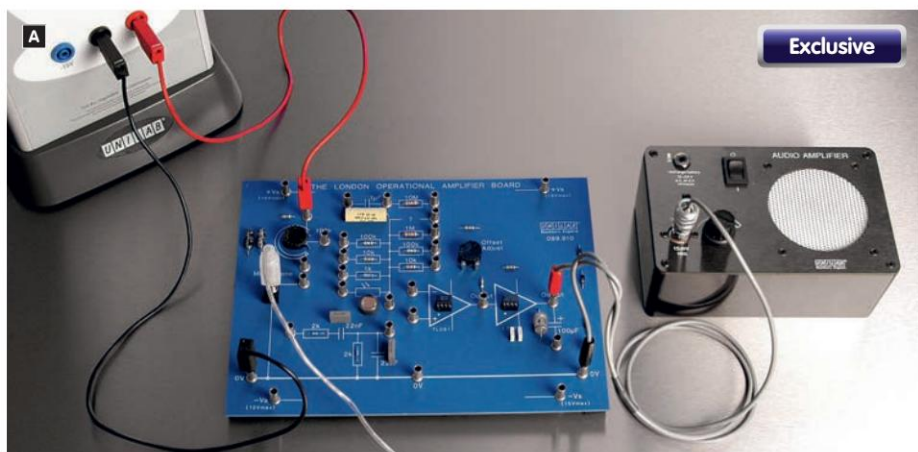
E8H28937

each £16.95



CROSS REFERENCE

4mm Stackable Plug Leads see page 468



Exclusive

A "London" Operational Amplifier

Has input devices such as an LDR, microphone input, 100k Ω potentiometer and 1 μ F capacitor. There are six resistors with space for an additional component. An offset control is included, plus a 1A power amplifier for loads eg. a loudspeaker, motor or lamp. A Wein network is included. Output can be fed through the power amplifier into a loudspeaker.

E8H29206

each £53.95

B Operational Amplifier

Arranged with 5 input resistors, 2 feedback resistors and capacitor, all selected by plug-in leads. An offset control is also fitted. Two 10k Ω potentiometers allow input voltages to be varied continuously. Regulated power supply between ± 5 V to ± 15 V is required.

E8H28093

each £46.95

C Push Button Switch

An on/off push button switch.

E8H27660

each £9.95

D Reed Switch

A heavy-duty reed switch protected by series resistor, a magnet operates the switch.

E8H27970

each £15.95

E S.P.D.T Switch

Single pole double throw rocker action switch.

E8H27933

each £9.95

F Variable Resistor

A 10k Ω linear potentiometer.

E8H28846

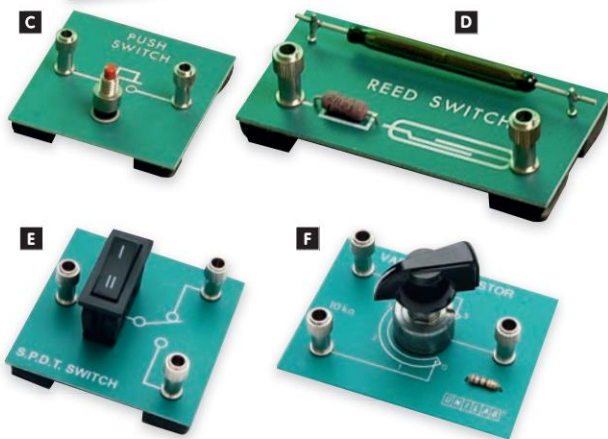
each £24.95

Low Value Resistor Board

Resistors of value 100, 1000 and 10,000 Ω .

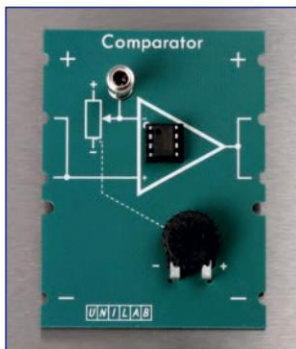
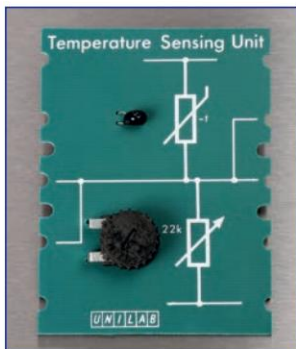
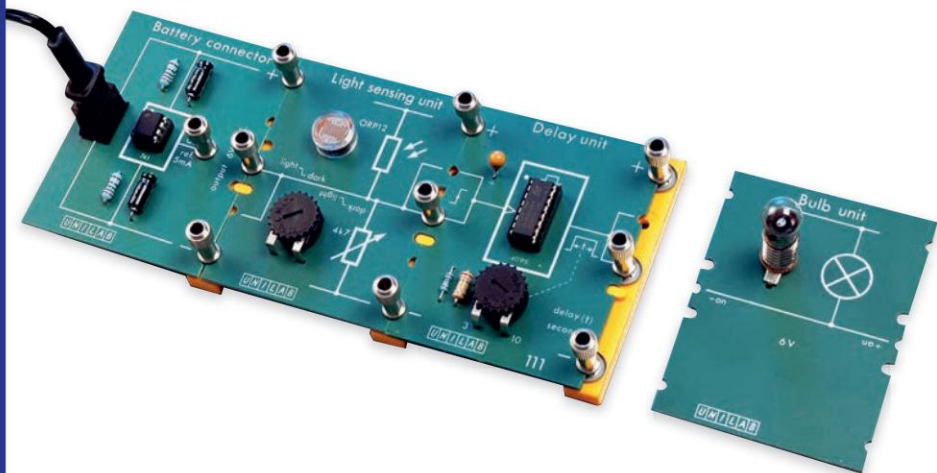
E8H28731

each £7.99

**CROSS REFERENCE**

Audio Amplifier and Loudspeaker see page 296

Exclusive



Alpha GCSE Physics Students Kit

The Alpha GCSE Physics student kit (for one working group) has been designed to cover the common electronic content of all GCSE syllabuses.

Topics covered are: potential divider, characteristics of light-dependent resistor and thermistor, transistor as a switch and as a current gain device, logic gates (AND, OR and NOT). The use of sensing devices to control an output device provides an opportunity to apply their understanding of signals and simple signal processing, including conversion of a gradual analogue change into a digital on/off signal, for use in logic systems.

Contents:

- 1 x Alpha Power Supply Regulator Board
- 1 x Comparator
- 1 x Inverter
- 1 x Two Input OR Gate
- 1 x Two Input AND Gate
- 1 x Transistor Switch/Indicator
- 1 x Diode Unit

- 1 x Temperature Sensing Unit
- 1 x Rain Sensing Unit
- 2 x Switch Unit
- 1 x Light Sensing Unit
- 1 x Input Voltage Unit
- 1 x 100k Potentiometer
- 1 x Power Link Board
- 1 x AlphaLink (Brown)
- 5 x AlphaLink (Yellow)
- 1 x Buzzer Unit
- 1 x Bulb Unit

PLEASE NOTE: To power the system, the Alpha Power Supply Regulator Board is included. This takes 8 to 12V d.c. or a.c. from any bench power supply and converts it to a regulated 5V d.c. with a centre tap of 2.5V. It limits the current supplied to an Alpha circuit to 0.5A. It is the ideal way to power Alpha, virtually eliminating risks of accidental overload and incorrect polarity.

EH876713

kit £149.95



CROSS REFERENCE

Bench Power Unit see page 386

A



C



A Decade Capacitance Box

This unit incorporates a high-grade 10-position switch which selects capacitance in the range $10 \times 1 \mu\text{F}$ ($1 \mu\text{F}$ to $10 \mu\text{F}$).

EBH27313

each £59.95

B Student Oscilloscope

- Inexpensive, single channel oscilloscope with simplified control layout for student operation and permanent triggering feature
- Introductory unit to teach the basics of oscilloscope use with a useful set of features e.g. 8 switched gains from 50mV to 10mV per division and a timebase with switched ranges of 1, 10, 100 or 1000ms across screen with variable $\times 1$ to $\times 10$ control

This extremely popular educational oscilloscope is robust and easy-to-use. The flat screen is 70mm across a diagonal with graticule marked in 10×10 0.5cm squares. Focus, Brilliance, X shift and Y shift controls determine the position and nature of the trace. A Y input can be passed to the Y

B



amplifier directly or through an internal capacitor to block a d.c. component. Note that with the slowest timebase setting, the spot takes 10s to cross the screen, ideal for slow analogue computing investigations. The start of the spot from the left-hand edge of the screen is synchronised automatically to the positive-going edge of the Y input. (N.B. this may mean that the track takes about 1s to settle down if the Y position is altered). The time base may be switched off and the X input p.d. used to control the horizontal position of the spot, e.g. in Lissajou's figures. Student audio signal generator not included.

The steel case is fitted with 1.8m of mains cable, a carrying handle which can be used as a lift stand, an on/off switch with indicator LED, and cable wraps at the rear.

- Y amplifier: FET input, 1MΩ d.c. to 10kHz
- X amplifier: 1MΩ d.c. to 100 kHz
- Syn. Input: 1MΩ input, triggering at 20mV
- Mass: 3.8kg
- Size 245 x 310 x 105mm

EB802656

each £457.95

C Capacitance Substitution Box

The Capacitance substitution box is housed in a 90 x 90 x 35mm grey plastic case with 4mm sockets. The 12-position switch selects the following values: 220, 470pF; 2.2, 4.7, 10, 22, 47, 100, 220, 470nF; 1μF.

Maximum working voltage 250V d.c. 'Make before break' switch.

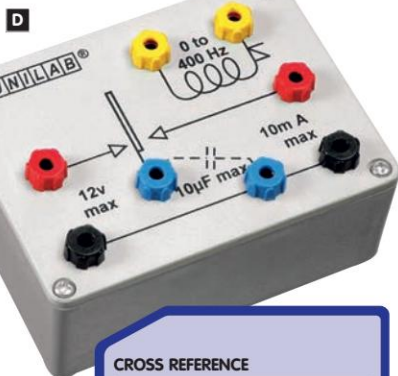
EBH27283

each £35.95



Exclusive

Innovation



A 1K Potentiometer

A convenient box with 2 mounted potentiometers for various electrical experiments, 4mm safety sockets are provided. Range: 0-10K ohms, 1W + 5% continuously variable 0-470K ohms, 1W + 5% continuously variable. Range: 0-10K ohms, 1W + 5% continuously variable 0-470K ohms, 1W + 5% continuously variable.

E8R05958 each **£18.95**

B Resistance Substitution Box

Switch Selectable values 470k Ω , 220k Ω , 100k Ω , 47k Ω , 22k Ω , 10k Ω , 4.7k Ω , 2.2k Ω , 1k Ω (all watt 5%); 470 Ω , 220 Ω , and 100 Ω (1 watt 5%); 'Make before break' switch.

E8H27234 each **£19.95**

C Resistance Units

A range of resistance units based on a high stability metal film element. They offer improved accuracy and robustness, and are less expensive than traditional resistance coils. Accuracy 1%.

	Resistance (Ω)	Max (V)	Max (mA)	each
E8H30725	20	3.0	150	£9.59
E8H30865	5	1.6	320	£13.95
E8H31122	10	2.2	220	£5.99

D Unilab Reed Relay

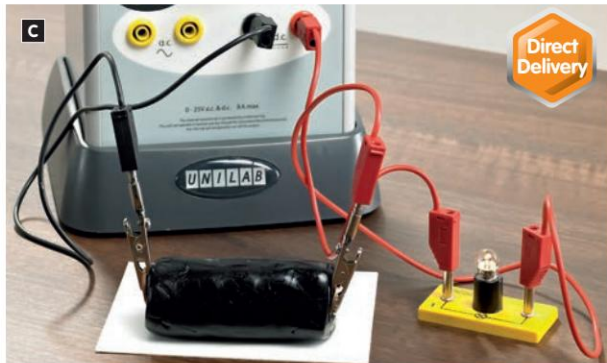
Nuffield specification 1010. A single-pole change over reed relay capable of up to 400 changeovers per second when driven by a Power Signal Generator, in repeated charge and discharge of parallel-plate capacitors. Maximum contact ratings: 12V, 100mA, 100V. Coil operating voltage approximately 5V r.m.s., d.c. to 400 Hz. A diode in series with the coil ensures only one changeover in every cycle. Size: 90 x 90mm.

E8H26795

each **£57.95**

CROSS REFERENCE

4mm Stackable Plug Leads see page 468



A Investigating Resistivity

Low cost apparatus for student investigation into resistance, length and cross-sectional area. Also acts as a bridge or potentiometer.

This 40cm Resistance Board is designed to allow students to investigate resistance quantitatively. The board is fitted with 4mm terminals connected by a length of resistance wire against a scale, and a "jockey".

Three different samples of wire with ratios of cross-sectional area 1:2:4 are provided. Experiments into the relationship between resistance and cross-sectional area can easily be conducted. If required other types of material can be connected between the sockets and their resistance investigated.

Sockets are provided to enable the board to be used as a 40cm bridge/potentiometer. The Unilab Basic Student Meter fitted with appropriate shunt is ideal for use with this board. Power can be provided by a 1.5V SP2 (R20) battery and/or any low voltage power supply (e.g. Lockmaster).

E8H27106

each **£49.95**

B Component Holder

Two crocodile clips (with sleeves which accept 4mm plugs) mounted on a 90mm length of tough black plastic channel.

E8H27337

pack 8 **£34.95**

C Conducting Putty

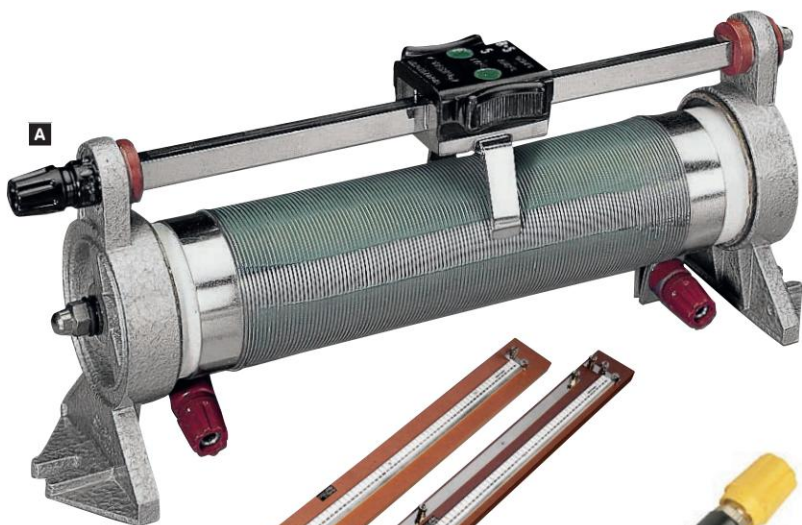
Conducting putty is a unique and versatile aid to the teaching of the topic of resistivity and the dependence of resistance on length and cross-sectional area of the conductor. The material is supplied in "blobs" of approximately 100g in mass. A cylinder 60mm long and 20mm in diameter has a resistance of about 20 Ω . Coins or washers placed on the ends of the cylinder can be used to connect it into a circuit. By altering the length and diameter in simple multiples, the relationship can quickly be established.

The substance is harmless, but messy, so plastic gloves are supplied for handling the putty.

Direct Delivery – up to 10 days

E8C53157

each **£15.95**



Our Own Design

C



B



A Rheostat, Standard and Extended Ranges

A comprehensive range of rheostats offering excellent value for money. They are wound with heavily oxidised resistance wire on a vitreous enamelled steel tube with the winding secured in place with a ceramic cement. The tube is supported on robust diecast end stands and the heavy duty sliding contact is of the multi-leaf phosphor bronze type, nickel-plated for corrosion resistance. 4mm terminal posts are fitted, facilitating external connection by conventional 4mm plug leads, spade terminals or bare-ended leads.

	Resistance Ω	Max current A	Tube size mm	Overall size mm	each
E8A49086	135	1.4	200 x 43	250 x 100 x 65	£33.95
E8A49098	55	2.3	200 x 43	255 x 100 x 65	£37.95
E8A49104	16	4	200 x 43	255 x 100 x 63	£37.95
E8A49116	8.5	5	200 x 43	255 x 100 x 63	£34.95
E8A49165	37	3.2	300 x 43	355 x 100 x 63	£35.95

Rheostat, Extended Range

An extended range of rheostats differing in resistance and dimensions from the standard range but in other respects having the same specification.

	Resistance Ω	Max current A	Tube size mm	Overall size mm	each
E8H04969	1200	0.3	200 x 38	255 x 52 x 92	£39.95
E8H04994	50	4	200 x 38	255 x 52 x 92	£37.95
E8H05044	25	5	400 x 68	465 x 90 x 153	£79.95

B Jockey

For Wheatstone bridge and potentiometer work, with moulded ribbed insulating handle, plated-brass contact with locating notch, and a plated-brass terminal with a 4mm socket. Dimensions: 95 x 15mm diameter.

E8H27099

each £7.09

C Potentiometer, 1m, Single Wire

Comprising a 0.56mm constantan wire stretched along a metre scale subdivided into millimetres and centimetres, clamped to stout, plated brass end plates. The clamping system is designed to make good electrical contact with the wire at the exact ends of the scale thus leaving virtually no margin for 'end errors'. The terminating strips are provided with heavy duty 4mm socket terminals and the whole is mounted on a stackable polished hardwood baseboard.

Supplied WITHOUT jockey.
Dimensions: 1.13m x 81mm x 50mm.

E8H27088

each £41.95

D Wheatstone Bridge

Comprising a 0.56mm constantan wire stretched along a metre scale, subdivided in centimetres and millimetres, clamped to stout plated brass terminating plates designed to ensure that the connections are made exactly at the ends of the scale. A heavy plated brass strip with 4mm socket terminals is fastened along the back of the baseboard and provides a two-gap system for normal Wheatstone bridge work.

Supplied WITHOUT jockey.
Dimensions: 1.08m x 81mm x 50mm.

E8H27076

each £42.95

A Interscale Demonstration Meter

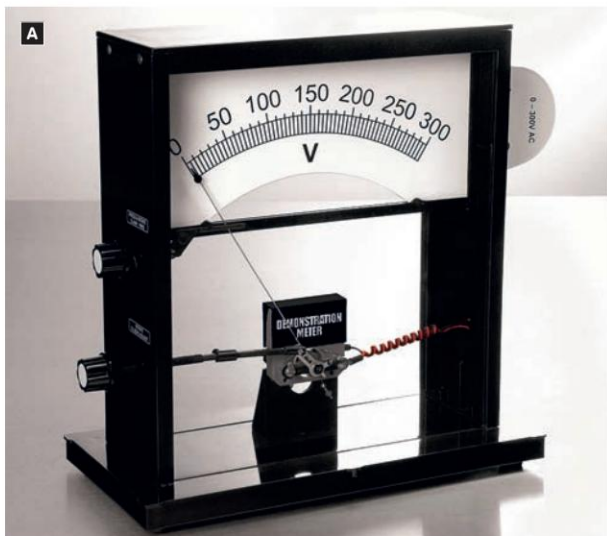
- Versatile meter that can show A.C. or D.C.
- Highly sensitive moving coil galvanometer
- Scale on both sides of the dial for class demonstration
- Easy observation of working parts

A versatile demonstration meter that can be converted from a Voltmeter to an Ammeter on either A.C. or D.C. by the use of interchangeable dials (sold separately). Each dial fits through a slot in the side of the case and connects through four fixed 4mm sockets. The meter operates using a moving coil galvanometer housed within a plastic case allowing all working/moving parts to be observed through either side of the meter. Scales are marked on both sides making this unit ideal for class demonstration. Dimensions: W300 x H310 x D150mm.

E8L16093each **£75.95****B Decade Resistance Unit**

For use as an accurate potential divider, ratio arm etc. This unit employs high stability metal film resistance elements having superior characteristics to traditional wire wound coils. It is equally suitable for a.c. or d.c. use. The individual decades are series connected, each having switched positions of 0 to 9, and are mounted in line with 4mm socket terminals linked to the ends of the chain. The top panel is clearly marked with the resistance value.

- Range: 999992
- Tolerance: $\pm 1.0\%$
- Dimensions: 220 x 110 x 60mm

E8L32177each **£99.95**

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Code	Dial Range	Input	each
E8L15969	2.5-0-2.5mA	D.C. Current	£15.95
E8L15970	0-10mA	D.C. Current	£15.95
E8L15982	0-100mA	D.C. Current	£15.95
E8L15994	0-1A	D.C. Current	£15.95
E8L16007	0-10A	D.C. Current	£15.95
E8L16019	0-IV	D.C. Voltage	£15.95
E8L16020	0-15V	D.C. Voltage	£15.95
E8L16032	5-0-5V	D.C. Voltage	£15.95
E8L16044	0-10mA	A.C. Current	£15.95
E8L16056	0-1A	A.C. Current	£15.95
E8L16079	0-15V	A.C. Voltage	£15.95
E8L16081	0-300V	A.C. Voltage	£15.95

B**Our Own Design**



Our Own Design

Practical Information

THE BENCHMARK RANGE

A range of digital meters designed to provide accurate, high quality instruments for education applications. The design of the meters, including the positioning and identification of the 4mm sockets and the graphics on the front panel, ease the conceptual jump from circuit diagram to physical implementation.

- Display: 3 1/2 digit LCD with polarity and low battery indication, internal battery 9V type PP3 or equivalent. Expected battery life 5000 hours from alkaline PP3. Automatic switch off after 50 minutes of inactivity. Battery not included.
- Accuracy: $\pm 1\%$ of full scale indication typical (except Coulombmeter).
- Dimensions: 130 x 92 x 55mm.

A Digital Voltmeter

0 to 19.99V d.c. only. Overload capability: $\pm 100V$. Internal resistance: $1M\Omega$.

E8H27763

each **£52.95**

B A.C. Voltmeter

Range: 0 to 19.99V. Input impedance: $1M\Omega$. Overload capability: 100V. Frequency response, $\pm 2\%$: 0 to 10kHz.

E8H29954

each **£57.95**

C Digital Millivoltmeter

Range: 0 to 1999mV. Input impedance: $10M\Omega$. Overload capability: 100V. Frequency response, $\pm 2\%$: 0 to 10kHz.

E8H29164

each **£66.95**

D A.C. Ammeter

Range: 0 to 19.99A. Input impedance: 0.01Ω . Overload capability: 100V. Frequency response, $\pm 2\%$: 0 to 10kHz.

E8H28342

each **£66.95**

E Digital Ammeter

Range: 0 to 19.99A d.c. only. Internal resistance: 0.01Ω .

E8H27726

each **£43.95**

F Digital Milliammeter

0 to 199.9mA d.c. only. Internal resistance: 1Ω .

E8H29097

each **£52.95**

G Coulombmeter

Range 0 to 1999nC. Accuracy: $\pm 10\%$ of F.S.D. Overload capability: 100V.

E8H29723

each **£69.95**

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A**B****C****D****UNILAB®****Exclusive****E****F****G****A Plug-In Electricity Cost Monitor**

Use the meter to monitor and measure the energy usage of any 13 amp rated electrical appliance. Plug the meter into a powered mains socket and then plug the appliance you want to monitor into it. It also calculates the cost of electricity used and assesses the carbon footprint.

- Voltage Rating: 240V ac 50Hz
- Current rating: 13A
- Maximum load: 3120W
- Power Consumption: 0.5W
- Metering: Voltage 200 to 276V AC, $\pm 1.5\%$
- Frequency range 45 to 65Hz
- Current range 0.005 to 13A, $\pm 1.5\%$
- Power range 0.1 to 3120W, $\pm 1.5\%$
- Power Factor: 0.00 to 1.00
- Overload power setting and alarm
- Accumulative electricity usage range

E8R05543each **£17.95****B Easy-Read Meter**

Use the meter to measure the current through the Helmholtz Coils. The attachments are colour-coded and their sockets are arranged to help students grasp the concepts of shunts and multipliers. The basic unit has an input impedance of 100k Ω . The resolution is 0.01 and the accuracy is $\pm 2\%$. Supplied with a PP3 battery that gives a useful life of over 1000 hours, the Easy-Read displays 'LO BAT' when the battery needs to be replaced.

Mass: 0.25kg, Size: 95 x 90 x 55mm.

E8R02652each **£59.95****Easy-Read Attachments**

The black shunts adapt the Easy-Read for current measurement and their sockets are found in the ends of the attachment (current passes through). The orange multipliers adapt the Easy-Read for voltage measurements, and have their sockets on the front of the attachment (voltage is measured across a circuit component). The 20V d.c. attachment has an input impedance of 10M Ω .

At least one of the following attachments should be bought for each Easy-Read meter.

C	E8H30919	20V d.c. Attachment	each £17.95
D	E8H30737	10A d.c. Attachment	each £16.95
E	E8H30671	20V a.c. Attachment	each £22.95
F	E8H31067	1A/10A a.c. Attachment	each £76.95
G	E8R02651	20mA d.c. Attachment	each £23.95

UNILAB®

A Basic Student Meter

- 1000Ω movement, moving coil, scale length 74mm
- Full scale deflection 20.0-100mV, 20.0-100μA, accuracy ±2% of f.s.d.
- Wide range of shunts and multipliers available
- Large range of a.c. & d.c. currents and voltages may be measured
- Diode protection of the movement is incorporated and overloads of at least 12V d.c. can be tolerated

This meter was originally designed to meet the Nuffield A-level Physics specification 1002. For many years it has set the standard in low-cost analogue meters for education, being flexible and robust in use.

The meter has two scales (2-0-10 and 1-0-5) and adding a shunt or multiplier converts it into a dual or triple range ammeter or voltmeter. Mass: 0.37kg. Size: 150 x 100 x 70mm.

E8H30981

each £59.95

B Centre-Zero Meter

- 1000Ω movement, moving coil, diode protected against overloads up to 12V d.c.

A centre-zero meter, electronically identical to our Basic Student Meter (Item E). This unit is ideal as a galvanometer for investigating electromagnetic induction, or as an indicator in slow a.c. experiments. The movement is arranged as a 50.0-50mV, 50.0-50μA meter with a subsidiary scale marked 3.5-0-3.5 for use with the Dual 3.5mA shunt. Mass: 0.37kg. Size: 150 x 100 x 70mm.

E8H30841

each £90.95

Exclusive

Exclusive

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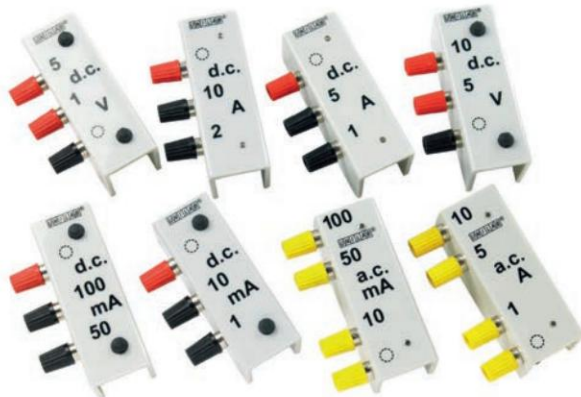
Spares
and
Accessories

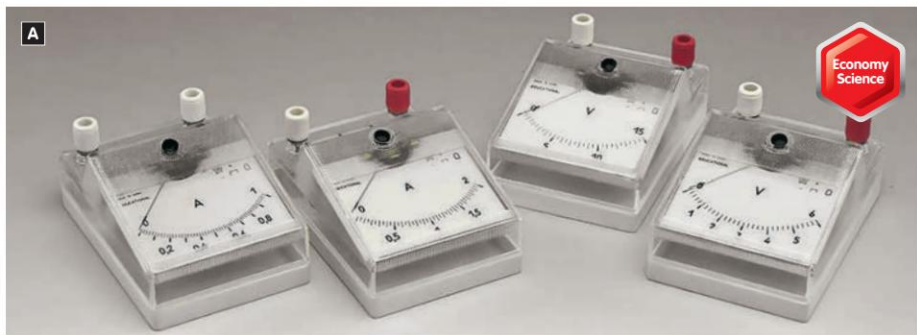
Multipliers

		each
E8H31043	5V/10V d.c.	£21.95
E8H31006	1V/5V d.c.	£14.95

Shunts

E8H31201	50A/100mA d.c.	£19.95
E8H30427	1A/5A d.c.	£15.95
E8H30385	2A/10A d.c.	£15.95
E8H30932	1mA/10mA d.c.	£20.95
E8R05054	Dual 3.5mA d.c.	£11.95
E8H31080	10/50/100mA a.c.	£42.95
E8H30683	1/5/10A a.c.	£51.95



Economy
Science**A Economy Bench Meters**

Moving coil, centre pole movements in clear plastic case.
Captive 4mm socket terminals, 4% accuracy, d.c. only.

	Range	
E8A74445	0 to 1A	each £9.99
E8A74457	0 to 2A	each £9.99
E8A74469	0 to 6V	each £9.99
E8A74470	0 to 15V	each £8.79

B Voltmeter, Dual Range

A moving coil voltmeter, suitable only for d.c. voltages.
Sensitivity 1000 Ω /V nominal. Ranges 5V and 15V.

E8A74640	each £51.95
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C Galvanometer 1000 Ω

A centre zero galvanometer 50 μ A - 0 - 50 μ A graduated every 2 μ A.
The resistance of the meter is about 1000 Ω .

E8A74729	each £35.95
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D Ammeter, Dual Range

This moving coil meter has two ranges, 0 to 1A or 0 to 5A and is suitable for d.c. only. Volts drop 75mV.

E8A74597	each £51.95
----------	-------------

Helpful
Hint**DEMONSTRATION IDEAS**

Scientists measure energy in joules (J), but electrical equipment is usually rated in watts (W) or kilowatts (kW). The connection is quite straightforward, the meter unit tells you the power (in watts) which is how quickly an appliance is using energy.

A 60 watt lamp uses 60 joules per second, a 2 kilowatt heater uses 2000 joules per second. If your TV is rated at 200 watts, it uses 200 joules per second. When you pay an electricity bill, you are charged for units called kilowatt-hours (kWh).

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www.findel-international.com



A Digital Multimeter

A professional instrument offering the normal multimeter functions and the ability to measure capacitance and frequency over a wide range with a high level of accuracy.

- Display: 3 1/2 digit LCD with 15mm characters and ancillary 40 segment bar graph. Full complement of display annunciators
- d.c. volts: 600mV, 6V, 60V, 600V, 1000V
- d.c. current: 600mA, 10A
- a.c. volts: 600mV, 6V, 60V, 600V and 750V r.m.s.: 50 to 600Hz
- a.c. current: 600mA, 10A r.m.s., 50 to 600Hz
- Resistance: 600Ω, 6kΩ, 60kΩ, 600kΩ, 6MΩ, 60MΩ
- Capacitance: 6nF, 60nF, 600nF, 6μF, 60μF
- Frequency: 100Hz, 1kHz, 10kHz, 100kHz, 600kHz

The above ranges are all full scale readings. Resolution is generally to four significant figures for each range. e.g. 60V would be resolved to 10mV. Frequency range sensitivity is 0.1V r.m.s. up to 100kHz. 0.5V r.m.s. above 100kHz.

- Audible continuity: Sounds if resistance being measured is less than 40Ω

- Input resistance: 10MΩ
- Accuracy typically: $\pm 0.8\%$ at $23^\circ\text{C} \pm 5^\circ\text{C}$ and 75% R.H. max
- Overload protection: 1000V d.c., 750V r.m.s. a.c. 0.5A fuse on current ranges. 10A range unfused. Other ranges, 400V d.c. or r.m.s. a.c. Over range indication in display.
- Data handling facilities: Data hold facility - max. limit selection, relative value selection
- Sampling rate: 3 samples per second
- Operating conditions: Temperature range 0 to 40°C (storage -20 to 60°C). Humidity 75% max (storage 80% max)
- Dimensions: 195 x 92 x 43mm
- Mass: 380g (500g in holster). Supplied complete with holster carrying case, test leads/probes, batteries and instruction booklet
- Safety: IEC1010, CAT III, 1000V

EBL20009

each £140.95

B Autoranging Digital Multimeter

Features a wide range of functions and a high level of accuracy. It offers the full range of normal multimeter functions as well as the ability to measure d.c. common emitter current gain of transistors. A rugged construction coupled with an effective electrical protection ensure a long working life.

- a.c. voltage: 200mV to 600V in 5 ranges
- d.c. current: 2mA to 10A
- Resistance: 200Ω to 20MΩ
- Capacitance: 20nF to 1000μF (4% accuracy)
- Dimensions: 158 x 74 x 31mm
- Diode Test Position: Forward current 1mA, reverse voltage 2.8V
- Accuracy typically in the range of $\pm 0.7\%$ or better

EBL49554

each £40.95

A



B

**A Multimeter**

Compact 3½ digit LCD digital manual range multimeter, ideal for educational use 20 ranges including transistor test, 10A current test, audible continuity test, diode test, and square wave 50Hz frequency test.

Overload protection on all ranges except 10A DC current range. Low battery indication. Robust ABS housing, with protective yellow rubberised holster.

A low cost multi-function instrument which offers excellent value for educational use.

Supplied complete with safety test leads, battery and instructions.

Designed in accordance with IEC1010 600V Cat II.

E8R06226

each £15.95

B Auto Ranging Digital Electronic Multimeter, Pocket Sized

The UT60 is an autoranging multimeter with RS232C interface enabling readings to be displayed on a PC. Features include fused 10A range, frequency, capacitance, data hold, selectable auto/manual ranging, continuity buzzer, full icon display, and low battery display. The meter is supplied with shrouded safety test leads, RS232C interface cable and CD with operating software which runs under Windows and enables the meter readings to be displayed in digital or graphical format on a P.C.

- d.c volts: 400mV to 1000V in 5 ranges
- a.c volts: 4V to 750V in 4 ranges

- d.c current: 400µA to 10A in 6 ranges
- a.c current: 400µA to 10A in 6 ranges
- Capacitance: 40nF to 100µF in 5 ranges
- Resistance: 400Ω to 40MΩ in 6 ranges
- Frequency: 10Hz–40MHz
- Diode test: 1mV resolution
- Accuracy: 0.8 to 4% depending on range selected
- Power requirements: 9V battery, type PP3 (included)
- Dimensions: H177 x W85 x D40mm
- Mass: 340g approx.

E8L16652

each £59.95



A Wimshurst Machine

Two transparent plates are supported in two rigid uprights and driven by belt in opposite direction. They are heavy, high resistance plastic with sectors of aluminium sheet. Two Leyden jars (condensers) made from coming glass and aluminium foil. The whole is mounted on moulded ABS base.

E8A48215

each £143.95

B Electric Fields Apparatus

This apparatus enables electric field patterns to be shown in much the same way that magnetic fields are demonstrated with iron filings, either by direct viewing or on an overhead projector. The apparatus comprises a clear plastic dish 90 x 12mm diameter x depth, and base 140 x 125mm, which carries a pair of 4mm socket terminals / electrode holders. Alongside each terminal is a thumb screw system which permits line height adjustment of the electrodes. Six electrodes are supplied, two 'point source', two 'line source' and two circular rings of 35 and 70mm diameter respectively.

E8H26771

kit £82.95

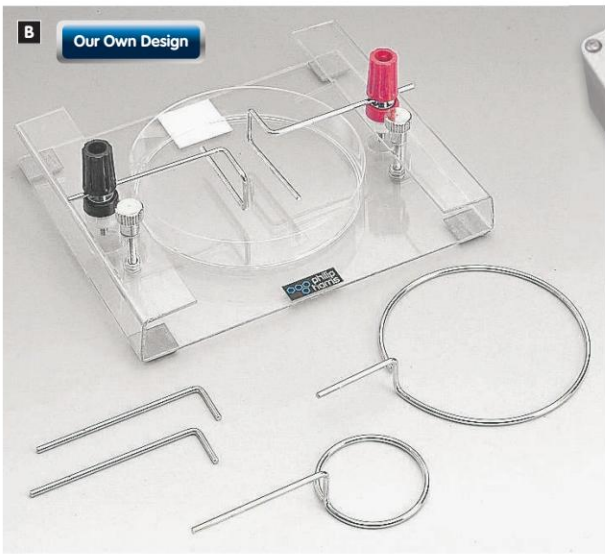
C Unilab Reed Relay

Nuffield specification 1010. A single-pole change over reed relay capable of up to 400 changeovers per second when driven by a Power Signal Generator, in repeated charge and discharge of parallel-plate capacitors. Maximum contact ratings: 12V, 100mA, 100µF. Coil operating voltage approximately 5V r.m.s., d.c. to 400 Hz. A diode in series with the coil ensures only one changeover in every cycle.

Size: 90 x 90mm.

E8H26795

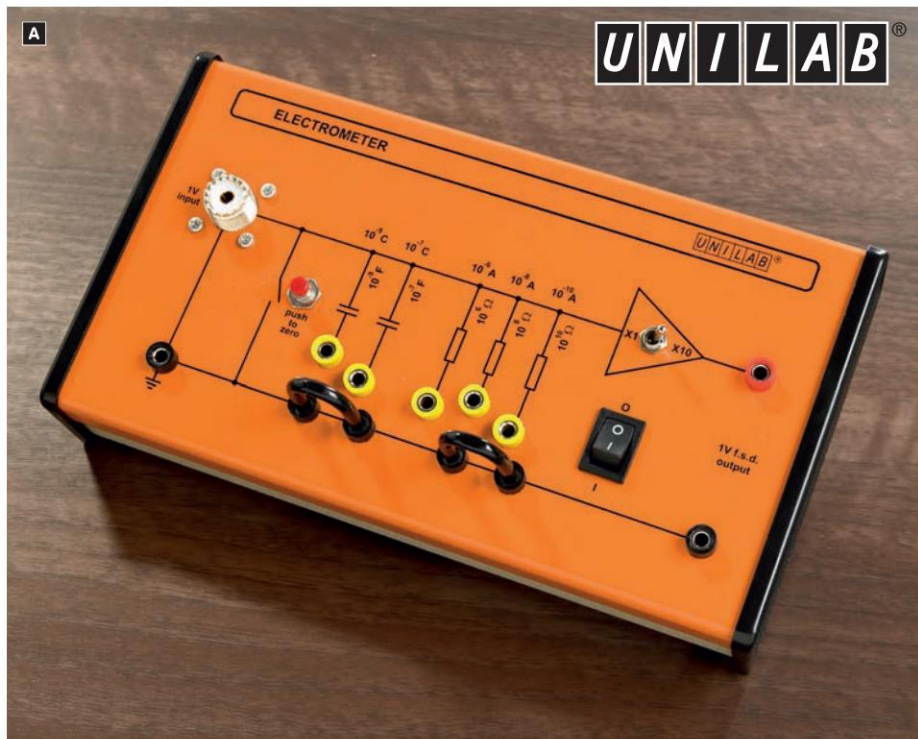
each £57.95



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UNILAB®



A Electrometer

Modern components and construction ensure much improved performance, reliability and robustness. For example, captive J-links are used to select the capacitance or current range required, while no zero control is required.

The internal 9V PP3 battery should give at least 6 months continuous use.

This instrument gives outputs in the range 0-1V in response to extremely small currents or charges. An external 1V voltmeter is used to show the reading. Selecting one of the 1nF or 100nF capacitors or 10WΩ, 1000WΩ (1GΩ) or 100GΩ resistors, (the x1 and x10 gain switch on the amplifier provides the decades between these values) means that current ranges from 100nA to 1pA or charge ranges from 107 to 109 Coulombs can be measured.

All 4mm sockets are PTFE insulated to minimise leakage currents.

The input socket is a UHF socket with 4mm central socket.

E8H28792

each £155.95

B Dual Purpose Electrostatic Scale

In this instrument a metal plate, to which a single gold leaf may be attached, is supported by an insulating bush in a glazed metal case provided with a 4mm socket earthing terminal. The front window is clear and the rear window is of ground glass.

An internal transparent scale divided 0 to 90° x 10° is provided for measuring the deflection of the leaf. Two interchangeable electrodes a disc top plate of 50mm diameter and a metal hook 160mm (are supplied)

Dimensions: 112 x 63 x 143mm high.

A supply of gold leaves cut to size with detailed instructions for fixing are supplied with each electrostatic scale.

E8H26679

each £25.95





A Malvern Electrostatics Kit

Ideal for small open experiments in electrostatics. The set is built around the dual-purpose electroscope which, while being suitable for general work also enables comparative measurements to be made on the activity of weak radioactive materials. The electroscope has an internal transparent scale divided to 0° to 90° in 10° . Removable glass panels are provided at the front and back, one clear and one ground. A removable insulation bush is fitted into the top of the case, which supports the plated metal blade to which the gold leaf may be attached, and a 4mm socket earthing terminal is fitted at the side of the case. Two interchangeable electrodes are supplied - a 50mm disc on a 10mm rod and a 10mm rod 160mm long, which may be removed after charging by using an insulating rod. Isolating the gold leaf mount reduces its capacity and increases the sensitivity of the electroscopes for radioactivity experiments. The kit comprises:

- 1 Electroscope as described with top plate and hook for electrode
- 1 Packet of gold leaves and detailed instructions for fixing
- 4 Metalised polystyrene spheres 16mm diameter
- 1 Reel of very fine nylon thread
- 1 Stirrup
- 2 Polythene plates 75mm square
- 1 Electrophorus plate 50mm diameter with an insulating handle
- 1 Proof plane, a 13mm diameter metal disc on an insulating handle
- 2 Aluminium cylinders 50 x 25mm diameter
- 1 Polycarbonate strip 250 x 25mm
- 1 Polythene strip 250 x 25mm
- 1 Cotton rubber

E8H26655

kit **£95.95**

B Battery Top EHT Power Supply

- Powered by a P1996 battery
 - Provides a stepped EHT output from 0-4200V (± 2100 V) in 700V steps via 4mm sockets
 - Output current limited to 140 μ A
 - Power warning LED
- Designed for safe use, this unit allows quantitative electrostatics experiments to be performed by responsible students.

Any of the stepped outputs can be connected to the top terminal via a 4mm lead, and any of the other outputs grounded so that the other six sockets are either positive or negative with respect to this. A sphere or collecting plate can be placed on the top terminal. Spooning charge is one example of an experiment that can be carried out with this unit.

E8H28305

each **£137.95**

C Ebonite Rod

Dimensions: 300 x 13mm length x diameter.

E8A47958

each **£2.29**

Perspex Rod

Polished finish. 300 x 13mm diameter

E8A47969

each **£4.19**

D Polycarbonate Strips

For producing electrostatics charge by friction. Dimensions: 250 x 25mm.

E8L01491

each **£1.79**

E8R02654

pack 10 **£15.95**

E Polythene Strip, Low Density

For producing electrostatic charges by friction. Size: 250 x 25 x 4.5mm.

E8H26631

each **£2.39**

F Round Balloons

Round balloons in assorted colours, each approx 178mm diameter. Pack of 100.

E8A48033

pack **£7.09**

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A Van de Graaff Generator

Hand driven. Overall dimensions: 350 x 190 x 480mm. Should fit any Philip Harris Van de Graaff Generator from the 1970s or later.

E8H26710 each **£119.95**

Charge Collecting Belt

Measuring 360mm long, 50mm wide and 1mm thick. Should fit any Philip Harris Van de Graaff Generator from the 1970s or later.

E8H26769 each **£24.95**

B Van de Graaff Generator, Motor-Driven

An efficient design for all the usual electrostatic experiments and for where a continuous source of high voltage is required. It has a strong metal base with profiled hand grips, housing a quiet running a.c. motor. The discharge sphere may be plugged into the base or supported separately, linked to the arching post with a standard 4mm connecting lead.

- Charge Collecting Belt: silicone rubber having excellent insulation resistance
- Tracking: belt-tracking easily adjusted
- Charge Collecting Combs: aluminium mesh, design to be clearly visible
- Spheres: aluminium, 175mm diameter
- Connections: 4mm sockets in dome and base
- Voltage Developed: up to 200kV, depending on ambient conditions, with a spark length of 60mm

- Discharger: spherical 75mm diameter on rod for plugging into the base earth socket or support in a retort stand
 - Supplied with 1.5m mains lead, illuminated mains on/off switch and fuse
- Dimensions: 225 x 180 x 480mm.

E8H26758 each **£375.95**

C Set of Accessories

The accessories are provided with 4mm pegs that fit into the top of the sphere.

The set comprises

- Perspex cylinder with metal caps and 4 metallised spheres
- Faraday's Pail
- Head of hair
- Point discharger
- Neon bulb
- Electric whirl
- Hair Comb

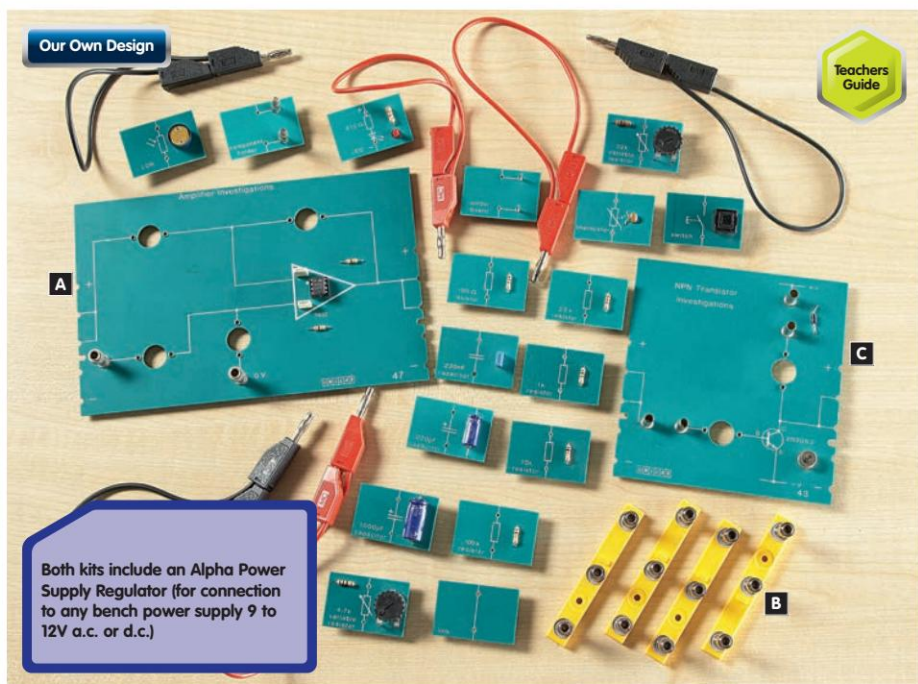
E8H26746 set **£76.95**

D 'Pith Ball' Electroscope

Comprises a pair of pith balls, 16mm diameter suspended by cotton threads from a wire frame stand. Overall height: 160mm approx.

E8H26667 each **£13.95**





Both kits include an Alpha Power Supply Regulator (for connection to any bench power supply 9 to 12V a.c. or d.c.)

A Alpha Transistor Investigations Kit

The kit enables students to explore the behaviour of an NPN transistor, which is mounted on an oversize Alpha board. Component panels, carrying a variety of resistors, capacitors, a thermistor, LED and LDR, plug into sockets on the transistor board. Extra sockets allow for connection of meters to monitor current flow in the base and collector circuits.

Simple and complex circuits can be quickly constructed and tested, using Alpha links to attach external components and sensors to the input (base) and output (collector). The emitter of the transistor is connected to zero volts.

Example circuits include: potential divider, thermistor in a potential divider, using a transistor as a switch, light controlled switch, using a capacitor for time delay, time delay switch.

The Transistor Investigations board can also be used with other Alpha boards to create a simple oscillator, capable of producing audible tones via a small loudspeaker.

Item

- Alpha, transistor investigations, NPN
- Alpha, potential divider
- Alpha, 4.7k potentiometer panel
- Alpha, component investigations
- Alpha, component holder panel
- Alpha, solder panel
- Alpha, 100 OHM resistor panel
- Alpha, 1k resistor panel
- Alpha, 10k resistor panel
- Alpha, 5k variable resistor panel
- Alpha, 22k variable resistor panel
- Alpha, thermistor panel
- Alpha, switch panel
- Alpha, LED panel
- Alpha, LDR panel
- Alpha, 1000uF capacitor panel
- Alpha, 220uF capacitor panel
- Alpha, 220nF capacitor panel
- AlphaLink (yellow)
- Alpha transistor investigations manual (on CD)

E8R02922

kit £173.95

B Central Terminal, Yellow

Central yellow terminal for Alpha boards.

E8H27519

each £4.19

C Alpha Operational Amplifier Investigations Kit

Operational amplifiers are common in many electronic devices. They amplify minute signals e.g. from a microphone to make them suitable for input to a power amplifier, or the signals from ECG sensors, to enable them to be displayed on a screen. This kit gives students an understanding of op amps, including input impedance and feedback, gain, amplification of d.c. and a.c. signals, saturation, differential mode, the use of a bridge circuit to detect and amplify very small changes – this has applications in the creation of sensors such as strain gauges. When used with a microphone, an Alpha Power Amplifier and small loudspeaker, a two stage audio amplifier can be constructed.

The manual (on CD) includes suggestions for extension work that involves discrete components and op amps, built on breadboard.

Item

- Alpha, amplifier investigations board
- Alpha, potential divider
- Alpha, 4.7k potentiometer panel
- Alpha, component holder panel
- Alpha, solder panel
- Alpha, 100 OHM resistor panel
- Alpha, 1k resistor panel
- Alpha, 2.2k resistor panel
- Alpha, 10k resistor panel
- Alpha, 100k resistor panel
- Alpha, 5k variable resistor panel
- Alpha, 22k variable resistor panel
- Alpha, link panel
- Alpha, LDR panel
- Alpha, thermistor panel
- AlphaLink (yellow)
- Alpha OP AMP investigations manual (on CD)

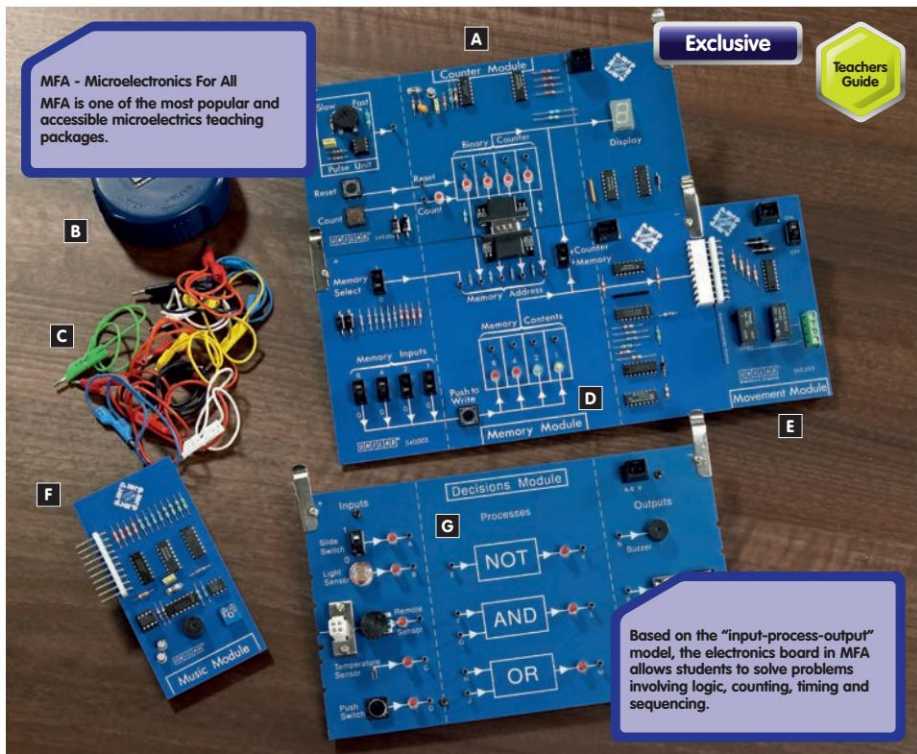
E8R02923

kit £193.95

MFA - Microelectronics For All
MFA is one of the most popular and accessible microelectronics teaching packages.

Exclusive

Teachers Guide



Based on the "input-process-output" model, the electronics board in MFA allows students to solve problems involving logic, counting, timing and sequencing.

A MFA Counter Module

This unit develops the concept of binary numbers. The board counts and displays the number of pulses received, using LEDs and a hexadecimal seven-segment display. The counter can be clocked manually by push button or by connection to an on-board pulse unit. It can also count events from another board.

E8H28079

each £71.95

B MFA Battery Holder for PJ996

This fits on top of a lantern battery and connects to MFA via a 50cm lead and keyed plug.

E8H30634

each £9.95

C 2mm Stackable Leads Pack

Includes 300mm black, 300mm red, 150mm black, 150mm red, 150mm yellow and 150mm blue. Suitable for all MFA experiments.

E8R05110

pack £19.95

D MFA Memory Module

With this board students investigate what is meant by an address in memory. When used with the Counter Module the memory chip provides two sets of sixteen locations, each of which can hold a 4-bit binary number. The data is also available at an edge connector, so that the Music and Movement Modules can be controlled by these stored instructions, as they are clocked through by the pulse unit in the Counter.

E8H28433

each £70.95

E MFA Movement Module

The Movement Module carries two SPDT relays which switch on and off according to the 4-bit binary input from the Memory Module. The board and relays are powered from a separate 6V battery and MFA Battery Cap. The relays switch the battery voltage to provide forward and reverse control of the two motors on the Dodger Buggy.

E8H28883

each £29.95

F MFA Music Module

Number patterns stored in Memory Module can be used to play simple tunes on the Music Module. The 4-bit binary number passed to it is decoded by the on-board circuitry to produce fifteen different notes from the small loudspeaker.

E8H29541

each £23.95

G MFA Decisions Module (Mark II)

This board is used to establish the ideas of inputs and outputs, high and low 'logic' levels, and how decisions are based on a set of conditions. The board carries four input devices: a slide switch, a push switch, a thermistor and a light sensor plus a socket for an external sensor. Outputs are a buzzer, an on/off relay and a bulb.

The central section of the board provides a NOT gate (inverter), an AND gate and an OR gate. All inputs and outputs are via 2mm sockets, with on-board LEDs to display the state of signals.

E8H27593

each £95.95

MFA Publications USB Set

MFA is a simple but powerful introduction to microelectronics. With emphasis on practical problem-solving, it will challenge your students to use the building blocks of electronics: input-process-output.

Contains a comprehensive set of PDF publications designed to introduce the concepts of electronics decision making, using inputs to control output, electronic counting, and using memory to store data.

Student support consists of printable workbooks, illustrated resource booklets and assessment materials. Teacher resources include INSET activities and detailed student assessment guides.

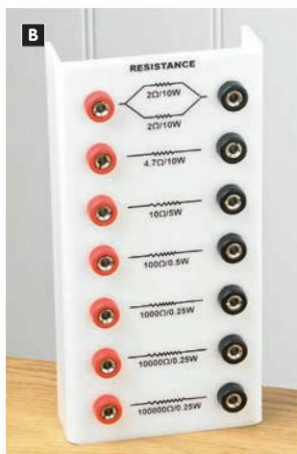
The MFA modules: Decisions, Counting and Memory can be used individually, and become more powerful when used together. The Music and Movement modules extend the activities into playing simple tunes and controlling Lego motors and other simple circuits.

MFA contributes to OCR Additional Applied Science Module 5 Communications, offering activities on: binary codes, flowcharts, logic, block (system) diagrams, the "input-process-output" description of systems, analogue and digital signals. Practical work is frequently related to real-world applications including: medicine, the home, agriculture, sport, manufacture, and music.

E8R02586

kit £35.95

Electronics made easy! Using the baseboard, circuits are built up by simply plugging in the modules. Each module has two or four 4mm plugs on its base, which connect through the groups of 4 sockets on the baseboard to adjacent modules. 4mm leads are used to bring in power and meters as required. The more complex functions, such as logic gates, have extra sockets on top of the modules, to take signals in.



A Electronic Plug-in Modules

A fixed 5V regulated power supply is recommended, but a variable regulated supply may be used with care. Meters for voltage and current in the ranges 0 to 5V d.c. and 0 to 10mA and 0 to 500mA d.c. Signals can be passed to an oscilloscope when that is appropriate.

Starting with basic component investigations, students can progress through Ohm's Law, capacitor discharge, diode and transistor characteristics, to create useful sensing and amplifying circuits. Then they can explore basic logic with the selection of single gates that can be combined to explore more complex logical solutions to problems.

Adding a signal generator and oscilloscope, students can explore the behaviour of a.c. signals when they encounter resistors, capacitors and inductors. Extension work is offered by the bridge rectifier and regulator modules, which can be used to create a functional regulated power supply.

Contents:

- Plug in baseboard with 24 'islands' of 4 interconnected sockets
- Passive components
- A selection of capacitors from 0.01μF to 1000μF
- Three inductors
- A selection of capacitors from 100 ohms to 470kΩ
- Variable resistors 1k, 10k and 1M ohms
- Push button switches (4)
- SPDT switch modules (2)
- Active components
- Transistors (BC109 and 2N2222 – 2 of each)

• JFET, MOSFET, Triac, Diode, Zener Diode, Bridge Rectifier and Regulator modules

Logic components

• AND, NAND, NOR, NOT (inverter), OR and XDR gates

Sensors and outputs

• Thermistor, Light sensor, Piezo buzzer/sounder, Lamp in holder, Reed switch & magnet, LED module (4)

Size: base board 308 x 245 x 45mm Mass: 950g

Small component (2 plugs): 40g each

Larger component (4 plugs): 60g each

EBR03096

kit **£473.95**

B Resistance Unit

A handy 7-way resistance unit for low voltage circuit work and Ohm's Law investigations, offering a range of values: 1, 4.7, 10, 100, 1000, 10000 and 100000 ohms. Each resistor is connected to a pair of red and black 4mm sockets. They can be connected in series or parallel to support investigation of the 'rules' for combining resistors.

The maximum voltage allowed depends on the resistor value, and its power rating. Students should appreciate the need for some simple calculations when selecting a resistor value. The Notes For Use provides guidance.

All resistors are rated at 0.25W

Maximum current: 250mA a.c. or d.c.

Size: 160 x 75 x 31mm Mass: 130g

EBR03097

kit **£16.95**

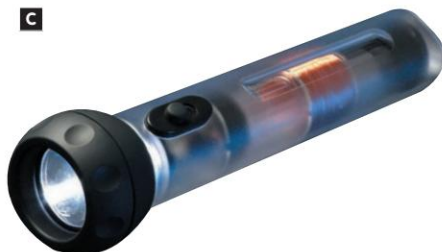


A

Our Own Design



B



C



D

**A Mounted Lamp 12V 24W**

For use with the mounted solar cell and a solar motor. A 12V 24W S.B.C. bulb in a metal socket mounted on a folded metal base 100 x 63mm with a pair of 4mm sockets. The power rating of the bulb has been chosen so that when it is placed in front of the solar cell sufficient power is produced to run a solar motor effectively whilst avoiding the risk of damage to the cell by excess light and/or heat.

E6H76804

each £11.95

B Mounted Solar Cell

To demonstrate the production of electrical energy directly from light energy. The apparatus comprises a selenium photo-voltaic cell housed in a plastic case with a diffusing lens front 25 x 25mm. Dimensions: 100 x 45 x 65mm.

E6H25705

each £23.95

C Faraday Perpetual Flashlight

A torch that uses the principle of Faraday's Law of Induction that never needs batteries. Shaking the torch passes a magnet through a copper coil which creates an electric current. This current is then stored in a capacitor which powers an ultra bright LED that can be seen for up to a mile. After an initial three minutes shake to get it going, the torch then only requires 45 seconds of shaking to provide enough electrical energy to power the LED light for up to five minutes.

E8L03128

each £18.95

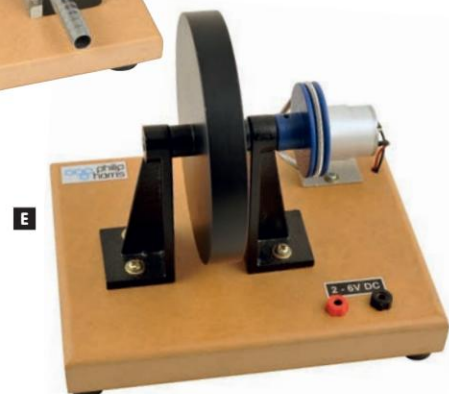
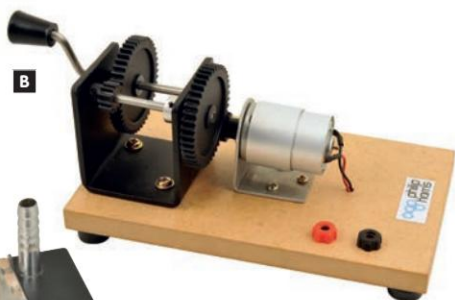
D Hand Generator Set

Involve students in investigations by using their own energy to generate d.c. electricity. If the handle is turned slowly, the bulbs of, for example, the Triple Lamp Unit, will light dimly; if turned faster, the bulbs become brighter. A high quality motor unit driven from the hand crank via two stage step up gearing. Capable of generating approximately 6V d.c., with the polarity determined by the direction in which the handle is turned. Supplied with 1m of detachable twin lead terminating in a pair of crocodile clips. Dimensions: 140 x 114 x 39mm. Mass: 115g.

Direct Delivery – up to 10 days

E8A42948

each £46.95



Nuffield Secondary Science Energy Transfer Series

In this range of compact self-contained apparatus, each unit has an integral d.c. motor/generator permanently geared to the main shaft so that a separate driving unit is not required.

The apparatus is always ready for immediate use and requires minimal setting up. All units are mounted on standard 160 x 100mm baseboards with rubber feet and are provided with 4mm socket connectors.

A Nuffield Line Shaft Unit

To demonstrate the cycle of energy change from electrical, to mechanical to potential stored in the raised mass, back to mechanical and finally electrical energy used to light the lamp. The shaft extends 50mm beyond the end of the baseboard and is provided with a pair of collars to form the winding drum for the cord.

EBH30518

each £45.95

B Hand Driven Generator Unit

For demonstrating the variation of electrical output of a dynamo with its rate of rotation and the way in which the electrical load connected to it affects the amount of work required to drive it. The double stage step-up gear system gives an overall ratio of approximately 1:25.

EBH30499

each £62.95

C Turbine/Pump Unit

For use as a water turbine to drive a generator producing electricity or for use as a pump driven by a motor and raising a head of water to produce potential energy. The rotor has eight 'bucket' blades and is housed in a black turbine chamber 50 x 50 x 25 mm with a clear perspex front. Two inlet tubules (for turbine and pump operation respectively) and one outlet tubule are provided, and the shaft carries a 15mm diameter pulley.

EBH25638

each £48.95

D Nuffield Spring Unit

This unit is used to demonstrate the reversible series of changes from electrical energy (battery or power pack), to mechanical energy (motor), to potential energy stored in the spring, back to mechanical energy (the spring driving the motor/generator), finally returning to electrical energy to light a lamp. The large clock spring is provided with a ratchet and pawl and geared to the motor/generator. The spring may be wound by hand if necessary. Guard strips are provided over the spring and the gears.

EBH30415

each £79.95

E Flywheel Unit

For use with a large motor/generator and a lamp unit to demonstrate the conversion of electrical energy to kinetic energy and then back again. Comprising an iron flywheel 115mm diameter, mass 1.2kg, mounted in cast brackets with nylon bearings. The shaft has an aluminium 'V' pulley 44mm diameter, for driving with the spring belt supplied.

EBH25602

each £25.95

Helpful Hint

PRESENTATION

Display the Philip Harris engine models on a traditional overhead projector for a simple and effective demonstration of the various engine types.

Transparent Engine Models

Movable, transparent, functional models for demonstrating the operation of various engine types on an overhead projector. The models are made of high-grade, transparent acrylic, 3-5mm thick, which is extremely robust and durable. Dimensions: 250 x 250mm.

**A** Large Motor/Generator

For use as a driving unit or dynamo. Comprises a 2 to 6V d.c. motor provided with a 15mm diameter 'V' pulley. Supplied with driving belt.

E8H25560 each **£42.95**

B Wankel Rotary Piston Engine

E8L87038 each **£51.95**

C Steam Engine

E8L87002 each **£51.95**

D Triple Lamp Unit

For use with motor/generators to give an indication of their output when used as dynamos. The lampholders are connected in parallel. Supplied with ten lamps 1.25V 0.25A, M.E.S.

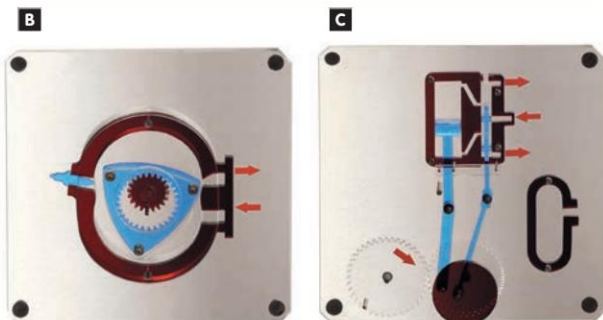
E8H76816 each **£11.95**

E Eddy Current Unit

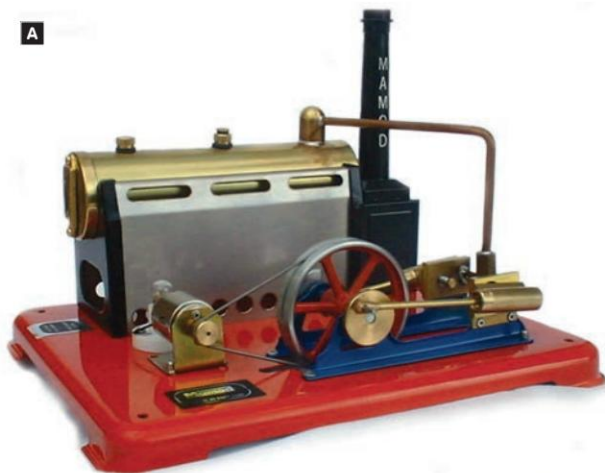
For demonstration of eddy current braking when used in conjunction with the handwheel driving unit. The 120mm diameter aluminium disc has a 20mm driving pulley. The powerful circular magnets are carried on a pivoted arm so that they may be moved over or away from the disc as required.

Dimensions of base: 165 x 165mm.

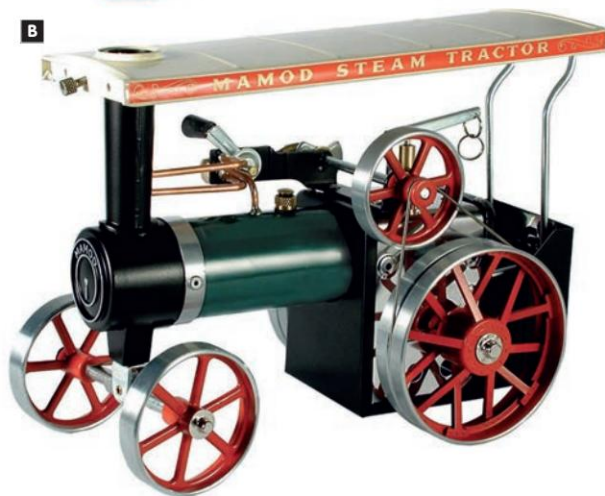
E8H79908 each **£37.95**



A



B



C



Practical
Information

PLEASE NOTE

The Steam Engines listed are models intended for demonstration only. They will require simple, regular maintenance to keep them in full working order.

Ensure that all moving parts are lightly oiled prior to use and all grub screws are tightened as these may work loose with prolonged use. After use ensure that the engines are cleaned (as per instructions) before storage.

For more information please refer to the instructions provided.

A Steam Engine SP5D

SP5D Steam Engine with Dynamo and bulb. (Forward running only).

Demonstrates states of matter, kinetic theory and exothermic reactions as steam is used to produce electricity. Model size: H200 x L260 x W208mm. Weight: 1.5kg.

EBR05630

each £251.95

B Traction Engine Starter Kit TE1A

The basic Traction Engine Starter Kit is an ideal introduction to model steam engines.

Assemble your own miniature traction engine with this kit. Demonstrates states of matter, kinetic theory and exothermic reactions as steam is used to produce motion.

Pack: 600 x 290 x 80mm. Weight: 2.2kg.

EBR05631

kit £233.95

C Solid Fuel Blocks

Solid Fuel blocks for use with our steam engines. 20 Tablets per pack.

EBR05629

pack £6.69

**BROWSE
OUR ENTIRE
RANGE
ONLINE AT**

www.findel-international.com



Bar Breaking Spare

Cast iron bars size 70 x 6mm diameter.

E8R05987

pack 10 £7.19

A Bar and Gauge

For illustrating expansion by heating and contraction by cooling. Comprising a bar of iron, 108 x 12.7mm length x depth, mounted on a support rod fitted with a wooden handle, and a brass gauge 150 x 38mm with a cut-out, which just admits the bar lengthways, and a hole which passes the bar endways when cold. Length: 225mm approx.

E8A42407

each £8.99

B Hero's Engine (Eolipile)

Comprising a borosilicate glass bulb 70mm diameter, with side arms bent at right angles and formed into jets at their tips. The bulb is carried upon a metal stand which leaves it free to rotate about its horizontal axis. If about 25cm³ of water is introduced into the bulb and boiled the issuing steam causes rapid rotation. Supplied complete on stand. Dimensions of base: 180 x 120mm.

E8L32190

each £43.95

C Ball and Ring

For demonstrating thermal expansion. The ball will not pass if it is hot and the ring is cold, but will pass if both are hot or both are cold.

E8A42390

set £6.59

D Bar Breaking Apparatus

Show the forces which can be exerted during thermal expansion or contraction. Comprising a heavy cast iron frame 340 x 120 x 100mm with slotted end pillars to carry a stout iron bar. The bar is threaded at one end for a large tensioning nut and has holes at the other end to accommodate the cast iron breaking bars. Supplied complete with ten breaking bars.

E8R05988

each £33.95

E Leslie's Cube

Tinplate box with 130mm sides. The vertical faces of the box are blackened, roughened, varnished and polished respectively. The top opening is 75mm diameter and is fitted with a lid. The apparatus is filled with water maintained at boiling point by a low bunsen flame. Infra red sensors may be used to compare the relative radiant heat output from each of the four faces.

E8L26899

each £17.95

A

Redesigned
and
Improved



A Ingen-Hausz's Apparatus

Comprising six equal rods of copper, iron, lead, brass, zinc and aluminium, each 130 x 3mm diameter, mounted in corks with their lower ends in a tank, 210 x 75 x 75mm. The tank is supported on four legs at a height of approximately 170mm above the bench. In use, the rods are lightly coated with paraffin wax and the rates of melting compared. Now painted with ceramic paint to withstand high temperatures.

E8L28903

each £29.95

B Set of Rods for Thermal Conductivity Experiments

A set of metal rods 300 x 3.2mm diameter, comprising one each of the following: Aluminium (240), Iron (72), Copper (395), Lead (34), Brass (128), Zinc (112). Conductivity in Wm⁻¹K⁻¹ at 373.2K is shown in brackets.

E8H25509

set 6 £9.79

C Bi-Metal Strip, Brass and Steel

For demonstrating the differential expansion of 2 metals by the curvature produced when the strip is heated in a Bunsen flame. Comprises strips of brass and steel, each 200 x 15mm, riveted together and mounted on a wooden handle. Overall length 320mm.

E8A42420

each £6.59

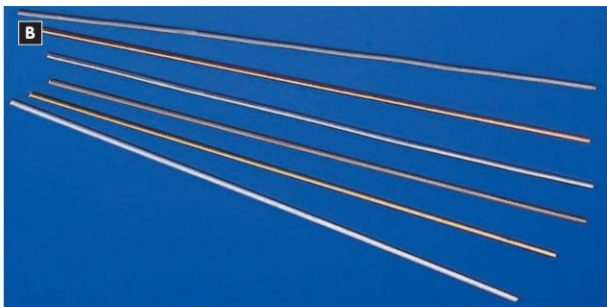
D Wood and Metal Cylinder

Comprising a cylinder 200 x 30mm diameter one half of which is wood, the other half metal. If paper is wrapped tightly round the cylinder and the rod is briefly held above a Bunsen flame, the portion in contact with the wood will be quickly scorched while the portion in contact with the metal will remain uncharred.

E8A42729

each £13.95

B



C



D



Helpful
Hint

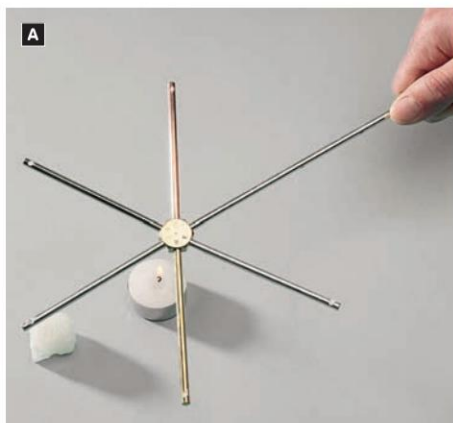
EXPERIMENTAL NOTES

The Ingen-Hausz's Apparatus is supported on a stand and the depression in the end of each bar is filled with wax which is melted in and allowed to cool.

When the bars are cool and a uniform temperature, they are heated at their common junction. The wax filled depressions are observed, and the time taken to just melt the wax at the inner edge is noted for each metal.

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



A Conductivity Star

Find out which metal conducts heat best by placing a small amount of wax at the tip of each rod and heating from beneath in the centre.

Pack includes a small block of wax and rods of aluminium, bronze, steel, nickel and copper.

E8G86207

each £7.79

B Thermal Conductivity of Metals Apparatus

Comprising bars of copper, iron, aluminium and brass with nominal thermal conductivities of 395, 72, 240 and 128 Wm⁻¹K⁻¹ respectively, each 80 x 20 x 1.5mm, provided with a hollow for wax and mounted on a wooden ring. 130mm outside diameter, 80mm inside diameter.

E8A42730

each £8.39

C Convection in Air Apparatus

Consists of an enamelled box 230 x 75 x 75mm with a sliding glass front and two detachable glass chimneys measuring 150 x 50mm diameter.

A lit candle is mounted underneath one of the chimneys and the resulting convection current can be observed by using smoke from a smouldering taper. Supplied WITHOUT candles.

E8H25523

each £38.95

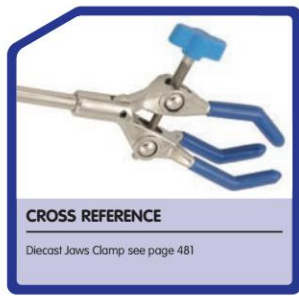
D Convection in Water Apparatus

Comprising a 360 x 210mm rectangle of 22mm glass tubing. In use the tube is mounted vertically in a retort stand. Convection currents may be generated by gently heating one of the lower corners of the rectangle, and a small amount of potassium manganate(VII) crystals dropped into the tube will act as an indicator.

Supplied as tube only WITHOUT clamps.

E8A42754

each £27.95



CROSS REFERENCE

Diecast Jaws Clamp see page 481

A



The diffraction effects that cause colour changes in the Liquid Crystals are best viewed with light falling on the strips from behind or to one side of the viewer. If working by a bright window, turn the apparatus side on.

B



C



A Crookes Radiometer

The traditional scientific curiosity comprising a partly exhausted glass bulb, 80mm diameter containing a delicately balanced rotor, having a set of four mica vanes approximately 15mm square. One side of each vane is matt black, the other white. When exposed to sunlight or a sufficiently bright incandescent light source, the temperature differential set up in each vane due to the surface finishes of its opposite sides causes the net force exerted by air molecule impacts to be slightly greater on the blackened side. The result is that the vanes rotate (very rapidly in direct sunlight), their white faces leading. Overall height: 125mm.

E8A42882

each £18.95

B Thermal Conductivity

The thermal conductivity set comprises four metal bars - copper, aluminium, brass and steel - held firmly together in parallel with a plastic rigid carrier. Each bar has a liquid crystal temperature sensitive strip attached and its conductivity value marked on the back of the carrier. The liquid crystal strips have 8 boxes and change to a green colour at about 40°C. The thermochromic liquid crystal used in the conductivity bars shows temperatures in the range 35°C to 45°C. The lowest temperature indication is a coppery red colour at 33°C and the hottest is a blue colour at over 45°C. The 35°C to 45°C appears in green.

E8R03213

each £38.95

C Radiant Heat Source, Low Voltage

A 12V 100W heating coil, wound over a rectangular former, is suspended between two pillars with integral 4mm sockets. A pair of aluminium sheet lined heat resistance screens, 75 x 63mm, each with 28mm aperture completes the apparatus, which is mounted on a rod measuring 150 x 8mm diameter.

NB: Power supply must be able to supply 8A due to 100W rating.

E8H25547

each £52.95

Redesigned
and
Improved

Radiant Heat Source

This ruggedly designed unit has been introduced to provide an alternative to the open element cylindrical radiant heat source. Whilst being intended for effective operation in all the Huxfield experiments, it is nevertheless designed with safety foremost in mind. The fully enclosed (apart from the output gridded steel case is earthed via the IEC mains lead, and an illuminated ON/OFF switch is incorporated. The broad base with rubber feet minimises the possibility of it being accidentally tipped over, and if this should happen, the radiating front surface is prevented from making actual contact with the bench top. For convenience of transportation, the rear of the case is provided with a carrying handle. A further safety feature inherent in the unidirectional design is that inadvertent radiation of heat in directions other than that required is avoided.

- Power: 300W
- Mains input: 230V nominal, 50 to 60Hz
- Output wavelength: 2.5 to 3.5 μm nominal
- Dimensions: W192 x D171 x H235mm
- Mass: 2kg

Supplied complete with detachable IEC mains connecting lead and basic operating instructions.

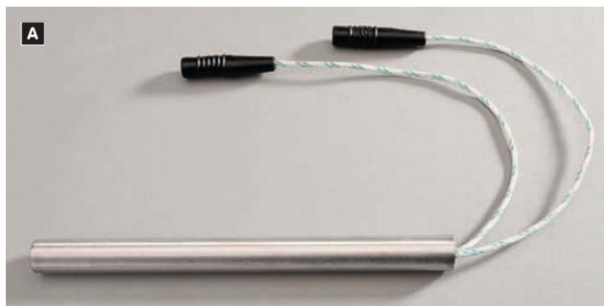
E8A42845

each £223.95



CROSS REFERENCE

Leslie's Cube see page 243



A Immersion Heater, 12V 50W

A fully sheathed miniature 12V, 50W (nominal) heater specially developed for use with metal block calorimeters. The element is housed in a 150mm stainless steel tube, the heated section occupying 70mm from the closed end. Electrical connection is via 180mm flying leads with heat resisting insulation, sealed into the body tube, terminating in 4mm sockets.

E8A42584

each £31.95

B Calorimeters, Copper

With parallel sides and rolled rim.

E8A42456

75 x 50mm

each £7.19

E8A42468

100 x 65mm

each £9.95

C Calorimeter, Aluminium

With parallel sides and rolled rim.

E8A42481

75 x 50mm

each £6.69

D Calorimeter Stirrer

Diameter: 40mm, length: 170mm.

E8R05623

each £1.89

E Metal Block Calorimeters

For the experimental determination of the specific heat capacity of different metals. Cylindrical metal blocks, mass 1kg adjusted to an accuracy of $\pm 2\%$. Each block is drilled with 2 holes: a large central hole, 12.5mm diameter for immersion heater and a smaller hole, 7.5mm diameter to suit a thermometer or temperature sensor.

		Specific heat, J/kg/K	Dia.	Heat Capacity	each
E8H25456	Copper	480	44mm	91	£29.95
E8H25444	Mild Steel	361	44mm	81	£12.95
E8H25432	Aluminium	878	75mm	86	£21.95



CROSS REFERENCE

Greenfill Thermometers Classroom Pack
see page 418



Simple layout for ease of use

Redesigned
and
Improved

S-Range Digital Joulemeter

- Determine specific heat capacity of metal
- Measure the enthalpy changes of reactions taking place in a solution
- Investigate the efficiency of energy conversion
- Meter output sockets for display of watts

This accurate electronic joule and wattmeter, usable with both alternating and direct input voltages, can be used to measure the energy supplied to electric heaters in calorimetry experiments and for energy conversion investigations when it is required to compare the input and output energies of motors and dynamos. At a more

advanced level it can be used to measure the energy stored in a capacitor. It can also be used to show that maximum power is dissipated when the source and load resistance are equal, and that no power is dissipated in a purely reactive load. An oscilloscope may be used to compare the input voltage and the instantaneous power dissipation, and to demonstrate the difference between average and peak powers, and the effect of phase angle variation. The instrument has four internal shunts to give maximum current ranges of 0.7mA, 7mA, 0.7A and 7A a.c. with a max. input of 15V (the maximum input power can be doubled when used on d.c.; the maximum voltage then being 20V d.c. with corresponding current maxima of 1mA, 10mA, 1A and 10A).

Each input current range has three joule ranges selected by a slide switch.

- Input voltage: 0 to 15 a.c. (21V d.c.).
- Input resistance: 1MΩ.
- Input frequency: d.c. or 50 to 1000Hz a.c.
- Max. load current: 0.7mA, 7mA, 0.7A and 7A.

E8H28354

each £431.95



Redesigned
and
Improved

Exclusive

CROSS REFERENCE

Immersion Heater, 12V 50W
see page 248

Practical Information

USING THE DIGITAL JOULEMETER AND HEATER

Known quantities of heat can be supplied to known masses of familiar materials (the Calorimeter blocks, or beakers of water or cooking oil). By comparing the resulting temperature rises, students can appreciate the distinction between heat and temperature. Further quantitative experiments will lead them to a formal definition of specific heat capacity. The relationship between an electric current and its heating effect can also be explored, neatly linking the topics of Energy and Electricity.

Joulemeter and Wattmeter

- 4-digit LED display of either energy delivered or power supplied
- 6 switch-selectable ranges, with internal shunts
- Output sockets suitable for connection to dataloggers and external counters

The unit is ideal for accurate measurement of either cumulative electrical energy delivered to a load from a power supply, or instantaneous power. A range of experiments are possible from simple investigations into specific heat capacity to measurement of energy stored in LCR Circuits.

When measuring energy delivered, an audible bleep (which can be switched off) indicates each increment of the least significant digit on the display, and the TTL Pulse (of duration 25 ms) is output via 4mm sockets for external counters. When measuring power, a voltage sensor across the 0-10V 4mm socket power output can be used for data-logging.

An instruction manual of experiments is included.

Display: 4-digit, 20mm high LED display with decimal point automatically moved by the range switch.

Input: 24V d.c. max or 17V rms a.c. max of any wave form d.c. to 10kHz.

Ranges: from 0.1mJ to 100J per count in 6 decades from 0.001mW to 100W (least significant digit) in 6 ranges LEDs indicate readings in mW and kJ.

Power: Mains unit with 1.8m of 3-core cable, illuminated ON/OFF Switch and 1A fuse.

Mass: 2.1kg.

Sizes: 240 x 160 x 160mm.

E8H28986

each £239.95

OCR 2.5.2 Energy Resources -
Energy Transfers



Exclusive

Energy and Fuels Kit

This award winning comprehensive kit allows students to:

- Investigate how energy can be transferred from one form to another
- Understand how electricity is generated and distributed
- Observe the efficiency of energy transfers in electrical appliances

The kit consists of a Fuel Cell Car Science Kit, Renewable Energy Education Set and the Green Chemistry: Production of Biodiesel Kit.

This set of resources is designed to make the topic of energy resources and transfers fun and easy to learn. Students will enjoy setting up their own wind turbine, using a solar photovoltaic panel linked to an electrolyser, producing crude biodiesel, constructing their own hydrogen fuel cell car and fan using hydrogen converted to electrical energy by means of a PEM fuel cell.

Comprehensive teacher and student notes are included. Worksheets are photocopyable.

Direct Delivery – up to 4 weeks

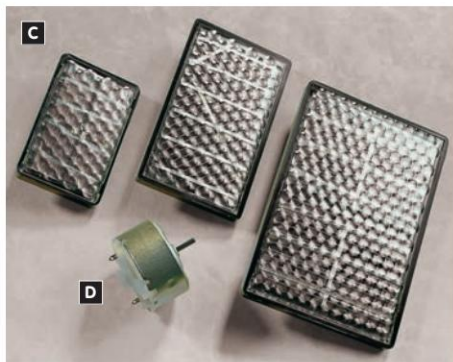
EBR03211

kit £479.95

**GLOBAL DELIVERY AND
AWARD-WINNING SERVICE**



Global Delivery and Award-Winning Service



A Solar Energy Kit

A comprehensive kit for investigating the properties of silicon photo-voltaic (solar) cells as a source of useful power, in an interesting and practical manner. The kit comprises eight individual 0.4V 100 mA cells. These may be accommodated in the base 'tray' which provides physical support and facilitates interconnection of the cells using the connector strips provided. The cells may be linked in a variety of series, parallel or series/parallel combinations to give the desired output characteristics. Also included is a low consumption electric motor with mounting components, connecting leads and a small fan to illustrate practical use to which the system can be put. The kit is supplied with a comprehensive instruction booklet which gives background technical information on solar cells, advice on interconnecting the cells for the different types of application and suggested uses to which a small solar battery can be put.

Dimensions of base tray: 110 x 95mm.

E8A43394

kit **£22.95**

B Solar Furnace

For demonstrating the high temperatures that may be generated by focusing sunlight in an appropriate manner, and illustrating an 'alternative' method of heating. The apparatus consists essentially of a rear aluminised parabolic mirror, 305mm diameter x 185mm focal length, and a matt black copper receiver vessel, carried upon an arm at the focal point of the mirror.

In clear sunlight the apparatus will rapidly boil water, or melt many fusible substances that are placed in the receiver.

The furnace is supplied in self assembly form, and includes a stand and full assembly/operating notes.

E8A43400

each **£109.95**

C Solar Cells

Output voltage 0.45V in clear sunlight. They may be linked in series/parallel for increased power.

	Current (Max.) mA	Dimensions	
E8A43357	200	55 x 35mm	each £2.99
E8A43369	400	75 x 45mm	each £11.95
E8A43370	800	95 x 65mm	each £13.95

D Solar Motor

RF510T, 0.3 to 4.5V (1300 r.p.m. at 1.5V). Axle diameter 2mm. Current consumption 22mA.

E8A43345

each **£1.68**

E Solar Dynamo Auto

Easily and quickly assembled. Runs on solar energy and also, if preferred, on a manual generator (dynamo). The vehicle moves forwards and backwards and the solar panel can be operated in a 360 degree radius. Includes full instruction manual.

E8A43382

kit **£33.95**

A WIND POWERED LIFT**SAIL CAR****WATER POWERED GRIST MILL****A Exploring Wind and Water Energy**

Go green and bring STEM concepts to life with the K'NEX® Exploring Wind and Water Energy Set! Designed to address critical science, technology and engineering concepts in the student's classroom and provide instructional models that will enhance student's understanding of these important concepts. Using K'NEX® and the lessons provided in the teacher's guide enables you to offer student's a program of study that uses hands-on exploration in conjunction with an engaging inquiry-based approach to learning. As student's work co-operatively they are encouraged to work together as they build, investigate, discuss and evaluate concepts, ideas and designs.

Set includes 288 K'NEX® parts – enough to build 6 renewable energy models, 2 at a time. Supports 1-2 students. Building instructions and comprehensive teacher's guide aligned to STEM included. Packaged in a strong storage tub with snap-on lid.

EBR05632pack **£77.95****B Wind Turbine Kit**

Developed in conjunction with the National Energy Foundation, the wind turbine kit offers a valuable insight into the production of electricity from wind energy. The kit offers the advantage of being able to measure electrical energy produced directly on a meter or using a datalogger.

Using the kit indoors with a desk fan or outdoors in the wind, investigations can be carried out by adjusting the number of blades used (any combination up to 12) or adjusting the pitch of the blades. The turbine also has a wind vane so will rotate to face the direction of the wind. Study of the production of electricity can then be further extended by investigating the effect on gearing ratios between the turbine and the generator, using any of the five different combinations provided.

Kit includes:

- 1.5-6V wind generator
- Dual bench voltmeter/ammeter
- Motor, LED and buzzer module boxes
- 5 gearing options
- 6 propeller blades
- Robust storage case
- Comprehensive lesson plans (photocopiable)

EBR01197kit **£189.95**



A Power House

Power House is a comprehensive wind power kit that allows pupils to build a working wind turbine to harness the power of air making the subject of environmental protection and energy conservation more tangible. This hands-on model helps teach about renewable resources, sustainable living and provides an overview of the many forms of alternative energy.

The 64-page, full-colour experiment manual offers instructions to guide you through the 20+ thorough experiments including how to demonstrate the power of wind, lighting an LED bulb and charging a rechargeable battery, as well as scientific explanations, and energy-saving tips. By building the Power House and then conducting experiments in and around the house, classes will learn about energy-efficient construction materials and passive house design. They will also be able to experiment with heating, cooling, conduction, convection, and insulation, investigate the Earth's climate, the water cycle, and the Sun. They are endless number of experiments that can be carried out such as testing passive solar collection methods with a solar collector, hooking up a photovoltaic solar panel to generate electricity from sunlight, building wind turbines to extract energy from the wind and constructing a greenhouse to learn about the energy conservation tricks used by plants. A very versatile and resourceful product!

EBR05092

each £81.95

B Solar Heating Kit

Developed alongside the Wind Turbine Kit by the National Energy Foundation, the Solar Heating kit allows investigations to be conducted into ways of using the energy from the Sun to help meet our energy requirements.

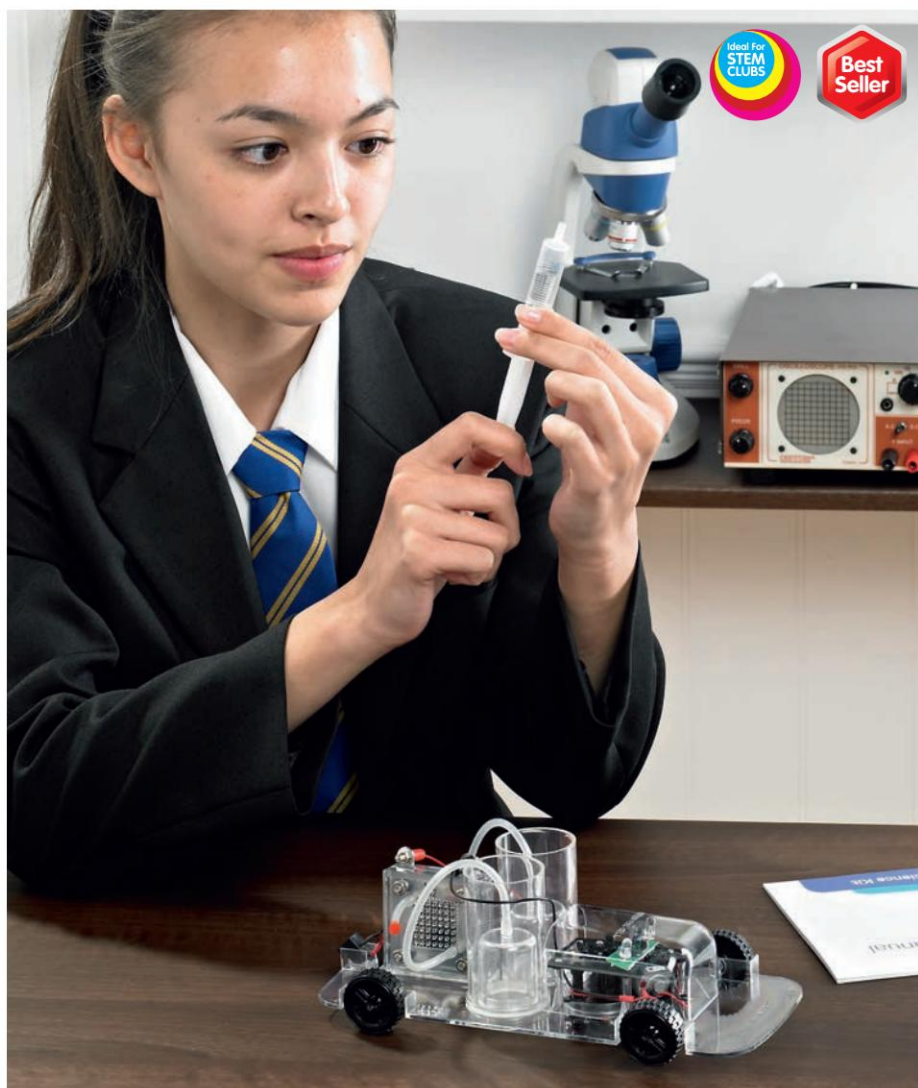
Allow pupils to quantitatively explore solar heating systems with this simple to use and effective kit. Use outdoors in the Sun or inside using an infrared lamp or desk lamp to measure the increase in temperature of the water in the copper pipe. The solar water heating kit consists of a length of copper pipe, sealed at both ends with rubber bungs, surrounded by a sheet of snug fitting coloured aluminium. A digital temperature probe is inserted through the bung at one end to monitor the temperature of the water inside. Investigations can be carried out into how thermal energy from the Sun (or a desk lamp) can be used to heat water.

Kit includes:

- 1.5V AA battery
- Digital thermometer (range 0-50°C)
- Aluminium solar clip fin
- Robust insulated storage case
- Comprehensive lesson plans

EBR01196

kit £78.95



Explore how the PEM (Proton Exchange Membrane) fuel cell converts the chemical energy of hydrogen and oxygen into electrical energy to power the motor.

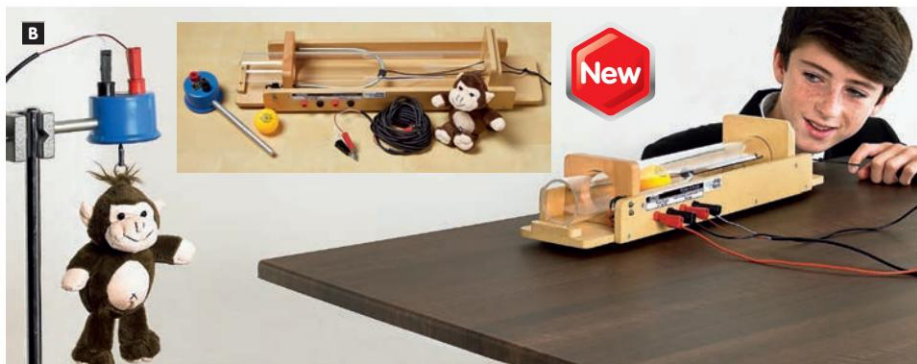
Fuel Cell Car Science Kit

Use this kit to construct a hydrogen fuel cell car and teach the principles of fuel cell technology. Once constructed, the car uses a steering mechanism to drive around obstacles. The 14 page user manual provides background information into fuel cell technology and full assembly instructions.

Contents: Reversible fuel cell, car chassis and wheels, electric motor, LED lights, water vessels, gas collectors, connector cables, syringe, battery pack and user manual.

E8L87336

kit £96.95



The Mini Ramp Surfaces are Sold Separately

A Monkey and Hunter Launcher

This demonstrates the equation of motion and projectile theory. This apparatus allows for an interactive study of the problem by students. A spring powered "rifle" fires ping pong ball "bullets" at a model monkey supported from a small electromagnet. The electromagnet is switched off at the instant the projectile leaves the gun. No matter what the distance is between gun and monkey, the ball will always hit its target giving a dramatic demonstration of the fact that any projectile falls at the same rate regardless of its horizontal velocity.

E8R06045

set £83.95

B Mini Ramps

Neat and compact ramps for floor or tabletop use. The solid wood ramps adjust to different heights and take apart for easy storage. The set includes five ramps and five open-backed trucks, which can be loaded for other investigations.

E8H34263

pack 5 £234.95

C Roll Out Mat

This 2m long mat can be written on using chalk, dry-wipe markers etc. The lines are split into 10cm indicators. The distance travelled by the truck can be easily recorded.

E8G92621

each £18.95

D Mini Ramp Surfaces

Five different surfaces that fit in the Mini Ramps. How do surfaces affect friction and the distance different trucks travel?

E8H50463

pack 5 £28.95

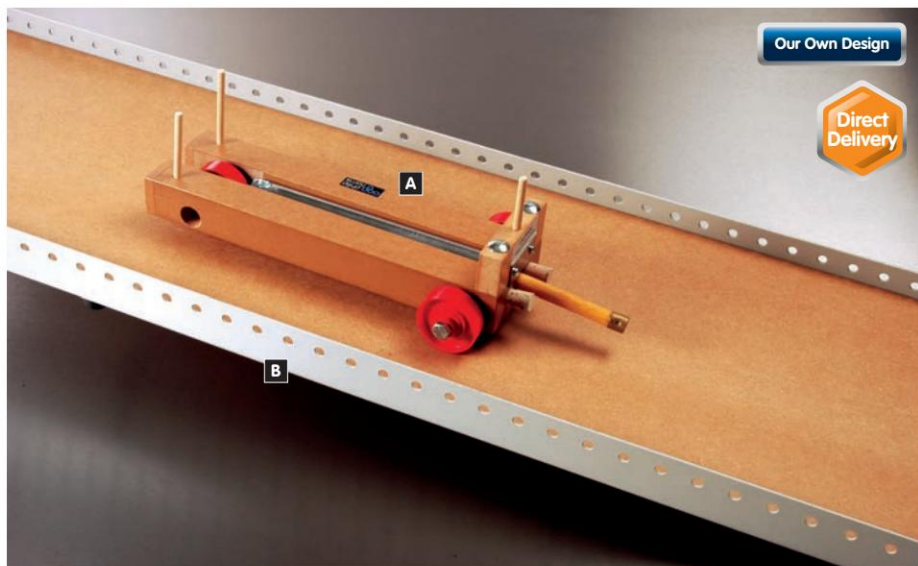
E Projectile Launcher

An ideal piece of apparatus for investigating the motion of projectiles. The apparatus can easily be clamped to a bench/desk (clamp provided) and the angle of projection can easily be adjusted through 90°. The angle is read by means of a plumb line that hangs past an angle measurer that is attached to the unit. Firing of the unit is obtained by releasing a spring-loaded rod that acts against a large ball bearing included.

E8L10327

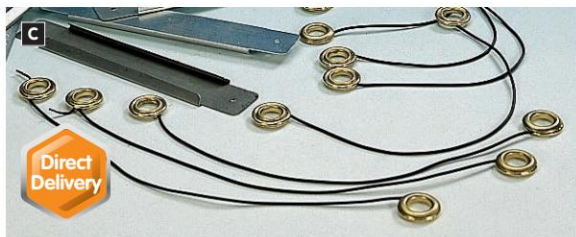
each £101.95





Our Own Design

Direct Delivery

**A Wooden Dynamics Trolley**

Ideal for experiments in:

- Basic acceleration down an inclined plane (diluted gravity)
- Investigation of the effect of different accelerating forces on different masses
- Investigation of elastic collisions between trolleys
- Investigation of inelastic collisions
- Investigating the sharing of momentum between two trolleys
- Simple harmonic motion

The trolley consists of a rectangular body carried upon three low-friction wheels and is supplied with one strong spring plunger and three dowel pegs.

Several trolleys may be stacked on top of each other and are held in position by holes drilled underneath which fit over dowel rods placed in corresponding holes in the upper surface of the lower trolley. This enables the effective mass of a trolley to be increased to twice or three times its basic mass. Sufficient space is provided on the flat top of the trolley for the addition of heavy loads. In the front end of the trolley are two holes with corks and if long pins are pushed through these corks, two trolleys can be made to stick together for inelastic collisions.

Dimensions: 290 x 140 x 90mm.
Mass: 0.87kg.

Direct Delivery – up to 10 days

E8A42006

each £78.95

B Trolley Runway (Long)

Designed to provide a smooth, flat, easily inclinable surface for dynamics experiments using trolleys.

With metal side rails and plastic feet.

Dimensions: 2.4 x 0.3m

Direct Delivery – up to 10 days

E8A84773

each £134.95

Trolley Runway (Short)

This is similar to the standard runway but at only 1.5m long is more convenient where storage space is limited.

Dimensions: 1.5 x 0.3m.

Direct Delivery – up to 10 days

E8A84785

each £106.95

C Elastic Cord with Eyelets

Comprising a length of elastic cord with a brass eyelet at each end.

Dimensions: 150mm unstretched length between eyelets.

Direct Delivery – up to 10 days

E8A42055

pack 10 £16.95

D Dynamics Trolley Metal

Dynamic trolley, all metal, compact design, one end of metal body carries an integral spring plunger/ trigger system for explosion experiments whilst the other end has a clamping screw for attaching ticker tape. Other built-in facilities includes velcro pads for non elastic collisions and locating pins to permit secure stacking of two or more trolleys. Compact design, constructed with all metal. Size: L20 x W20 x H8cm.

E8R05959

each £100.95

TO ORDER

Call

INT: +44 (0) 115 907 4001

ROI: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROI: 01 427 3118



Motion Measurement Kits

- These kits offer a simple way to purchase just what is needed for timing experiments with light gates
- The Basic Kit uses a Digital Stopwatch as the timing device - suitable for interval timing and average speed calculations
- The Advanced Kit is based on our unique Motion QED unit which computes speeds and accelerations with millisecond resolution

As well as a Stopwatch and Centi-second Timer Module (both powered from internal batteries) the Basic Kit contains two Light Gates and requires a 9-25V power source to drive the high intensity LEDs in the gates, together with eight 4mm leads (at least 75cm in length recommended).

This kit is suitable for simple experiments such as the speed of a vehicle which interrupts one gate, or the average speed between two gates.

The Advanced Kit has been improved and now contains one Master and one Slave Light Gate. It requires a 12 - 16V a.c. or d.c. power source to power the Motion QED unit. The light gates are now powered from the Motion QED unit via two DIN leads, this eliminates the need for the eight 4mm leads previously required by this kit.

The kit allows more complicated experiments into momentum exchange (for example using a Linear Air Track) as up to eight transitions of the two light gates can be sensed and the times of the events stored by the Motion QED unit.



A Advanced Motion Measurement Kit

Based on our exclusive Motion QED unit the kit contains: one Motion QED unit, one Master Light Gate and one Slave Light Gate. Up to eight transitions of the light gates can be sensed and the times stored by the Motion QED unit.

EBH76786 kit **£443.95**

B Light Gate

Our popular UNILAB Light Gate is fully protected against incorrect connection of signal or power and supplies from 9 to 25V a.c. or d.c. can be used. A signal LED indicates that the unit is functioning correctly when obstructed. The unit is compatible with all of our timing devices such as: Motion QED, Fast timer, Centi-Second Timer Module and Stopwatch and Scaler-Timer.

EBH27623 each **£68.95**

C Master Light Gate With Leads

For connection to Motion QED only. As above except both power and signal are carried by a single DIN lead. A further DIN lead connects the master light gate to a slave light gate. The 2 DIN leads included in the kit replace the need for eight 4mm leads, carrying both signal and power.

EBL86356 each **£118.95**

D Unilab Motion QED

Motion QED is a popular self-contained unit designed to store and calculate times, speeds and accelerations.

Specification:

Event Timer: From 2 to 8 readings, timing each event.

Interval Timing: From 1 to 4 readings: up to 4 successive obstructions on any combination of the four inputs can be measured and displayed.

Speed: From 1 to 4 readings: speeds in meters per second, display shows m/s are calculated and displayed for mask lengths of 1 to 10cm (in 1cm steps) or from 10 to 200cm (in 10cm steps).

Gap Timer: From 1 to 3 readings: similar to Interval Timing with only the leading edge of an obstruction being recognised so that times between gates are recorded and displayed.

Average Speed: 1 reading: based on the Gap Timing Mode above, this program calculates and displays an average speed in m/s between gates which are from 10 to 200cm apart (in 10cm steps).

Acceleration: 1 or 2 readings: for a vehicle carrying a single or double mask of known length passing through successive gates, the acceleration is calculated and displayed (as m/s²).

A useful feature of Motion QED is the ability to measure times which students then use to calculate speeds or accelerations. Once the theoretical groundwork has been

done, the unit can be used to perform the calculations directly, allowing students to concentrate on the physics.

Technical Details:

Inputs: 4 TTL inputs protected against misconnection up to 20V a.c. or d.c.; 4mm sockets with 1 "Manual" push-button. Outputs: 12V to power external devices such as light gates; 4mm sockets

Power: 12 to 16V a.c. or d.c. from a low voltage power supply.

Protection: two internal 500mA anti-surge fuses.

Timing: times to ± 1 ms.

Mass: 0.9kg.

Size: 240 x 135 x 45mm.

EBH28020 each **£359.95**

E Basic Motion Measurement Kit

The basic kit for Motion Measurement uses the Digital Stopwatch as the timing device. The kit contains a Stopwatch, centi-second Timer Module and two Light Gates. Minimum time interval 0.12s. Recommended for use with Bench Power Supply. Batteries available on page 100 - Duracell "Procell" AA and Button Cell, Silver Oxide, type SR44.

EBH76798 kit **£246.95**



A g by Free Fall Apparatus

To determine the value of 'g' by timing the fall of a steel ball. The release unit consists of a plate 90 x 45 x 3mm carrying a pair of metal clips connected to 4mm sockets. The clips are opened, thus dropping the ball and breaking the contact between the clips.

The trip unit is mounted on a base measuring 100 x 100 x 12mm and comprises of a trip plate, the end of which bears upon the blade of a micro switch and holds it in the closed position. When deflected downwards by the impact of the ball the trip plate releases the blade and opens the switch. The trip plate comes complete with a protective rubber strip to prevent the switch from damage should it be accidentally struck directly by the ball.

Kit comes complete with steel balls of 16mm and 19mm diameter.

E8H25316

each **£119.95**

B Fast Timer

The Fast Timer is a versatile, portable instrument for timing brief events with two ranges: 1 to 999.9ms and 1 to 9999μs. The inputs can be controlled by light gates, microphones or mechanical switches, connected via 4mm sockets. Two sockets provide 0 and 5V for connection to sensors if required.

The usual care is needed when using microphones to ensure that a repeatable sharp edge is obtained, e.g. use a toffee hammer and steel slab to produce a sharp noise when measuring the speed of sound.

Mass: 0.5kg.

Size: 170 x 135 x 45mm.

E8H25373

each **£231.95**

C Leeds Mechanics Kit

A complete kit for post 16 investigations in linear and rotational mechanics

- Inclined plane and friction experiments
- Circular motion and conical pendulum experiments
- Springs and damping experiments

The Leeds Mechanics Kit is a complete set of simple apparatus for practical investigations in Newtonian Mechanics that develops problem-solving and mathematical modelling skills. Areas covered by the kit are: Combining and Resolving Forces, Friction, Impact and Momentum, Motion in a Circle (horizontal and vertical, including the conical pendulum), Simple Harmonic Motion (with and without damping). Equipment is supplied in a sturdy wooden storage box, which also acts as a vertical force table.

E8H30580

kit **£869.95**





A Paper Tape Holder and Baseplate

Stand with 10mm stainless steel mounted rod to hold tape rolls. A specially designed stand to hold our ticker tape rolls, with easy possible, it is an excellent accessory. Paper not included.

E8R05960

each £64.95

Spare Paper Tape

Self marking spare paper tape for item A, 300m reel.

E8A41890

each £7.19

B Pendulum Bobs Pack

Comprising one solid sphere each of diameter 13mm, 19mm, and 25mm, of brass, copper, iron, lead and aluminium with a small ring for suspension.

E8R05990

pack 15 £21.95

C Ticker Tape-Timer

For the measurement of velocity and acceleration, using timing marks made on a moving paper tape by a vibrating 'striker'. Designed to operate on a 12V a.c. supply and uses the mains frequency as its timing standard. The unit is housed in a moulded case L115 x W60 x H70mm, including mounting flanges. The top of the case carries a tape guide with carbon paper disc support and adjustable 'anvil' for the striker point.

All moving parts are fully enclosed and electrical connection is via 4mm sockets.

E8H31055

each £67.95

D Pendulum Clamp

This sturdy pendulum clamp is constructed of an aluminium support bar with three screw clamps, attached to a die cast head clamp for use on support rods to hang weights and pendulums. Can attach to support rods up to 16mm in diameter.

Three screw clamps can securely and individually be used to attach weights with strings. This pendulum clamp makes it easy to simultaneously demonstrate or test the properties of simple harmonic motion in physics labs or classrooms. Size: 29 x 3 x 3cm.

E8R05975

each £11.95

E Ticker Timer

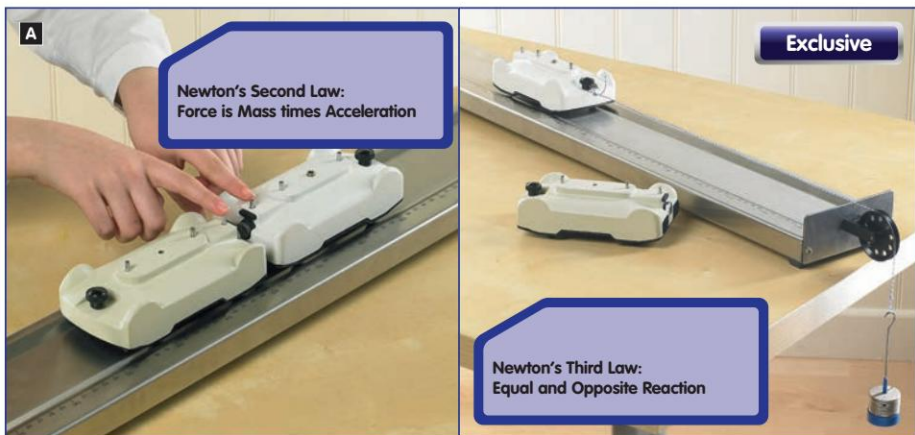
This extremely popular unit has revolutionised experiments because of the quality of the traces it makes, and the reliability of the mechanism ensures that ticker-tape experiments are no longer hit and miss.

There is no double-dotted or smearing, even at high speeds. No pen or carbon discs are required. Friction between tape and ticker-timer is kept to a minimum. Excellent results can be expected. The unit comes with a boss-head so that it can be easily clamped in a rod. Requires 2V AC from a low-voltage power supply. The unit is protected by a 2A internal fuse. Uses self-marking paper tape. Self marking tape is not included.

E8R06037

each £65.95

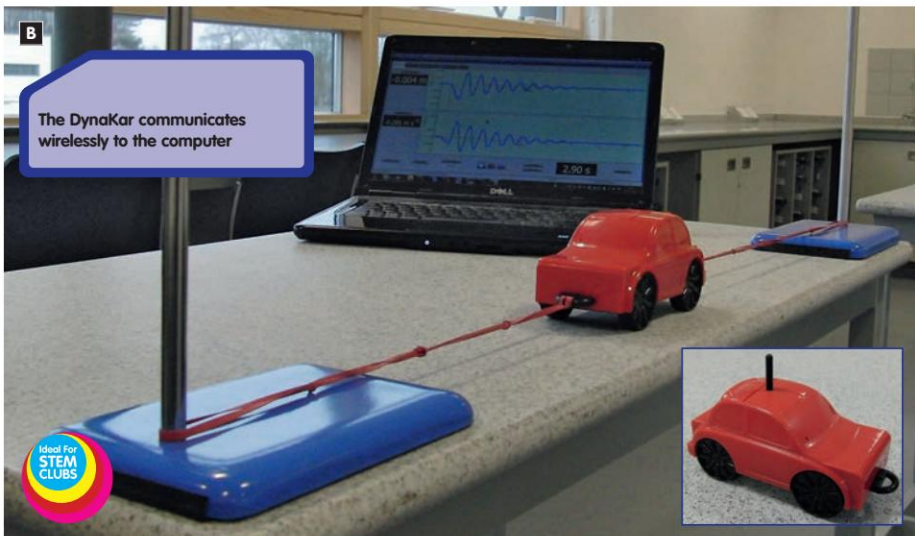




Exclusive

Newton's Second Law:
Force is Mass times Acceleration

Newton's Third Law:
Equal and Opposite Reaction



The DynaKar communicates wirelessly to the computer

Ideal For
STEM
CLUBS

A Dynamics Track and Trolleys

A convenient alternative to the linear air track and blower. A sturdy and near frictionless stainless steel track that provides a compact environment for many investigations that might be done using a linear air track. Two heavy trolleys with hard, free-running wheels, are included, plus a set of 100g x 10g masses and a reel of cord. The track has solid end panels, with a rubber coating to buffer any collisions. A cm scale is screen-printed along the length of the track.

Each trolley has a knob for attachment of cords for towing, and for ticker tape if that is the school's preferred method of capturing the motion of the trolleys. A 4mm socket on the trolley's top surface, allows for simple attachment of interrupter cards for use with light gates or timing software. A free-running pulley on one end of the track, allows

a mass attached to a length of cord to be used as the accelerating force for one or two trolleys. Note that the trolleys can be stacked to immediately provide a trolley effectively of double the mass.

Each trolley has a spring-loaded ram that can be set and released to provide reliable and repeatable launches. The ram can launch a trolley single or double mass from one end of the track, or simulate an "explosion" where two trolleys fly apart.

The "Notes For Use" includes work on acceleration, exploring $F=ma$, investigations on an inclined plane, momentum and "explosions".

Track: 1270 (inc pulley) x 120 x 60mm, Mass: 3.1kg
Trolley: 155 x 76 x 55mm, Mass: 0.65kg

E8R03093

kit £237.95

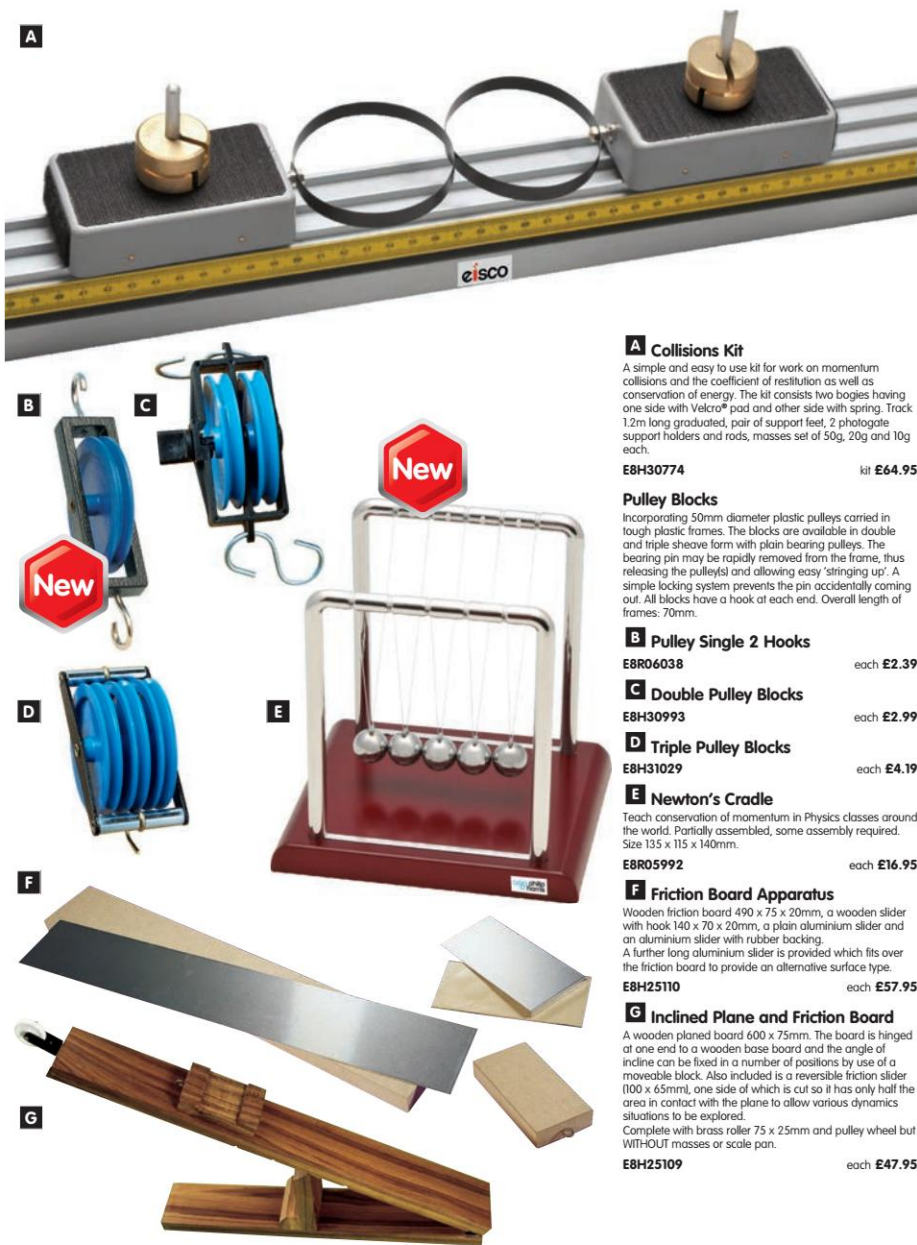
B DynaKar

The DynaKar is a unique product that simplifies dynamics investigations in Science, eliminating the need for lightgates and trolleys. The DynaKar communicates with the computer via a wireless device to create distance and velocity graphs. The DynaKar is extremely versatile and can be rolled along a simple ramp, or accessories and masses can be easily attached for collision and air resistance investigations.

- Easy setup with no drivers required
- Wireless communication to the computer
- 100 samples per second
- Resolution better than 1mm
- Powered by 2 x AA batteries

E8R04953

each £137.95



A Collisions Kit

A simple and easy to use kit for work on momentum collisions and the coefficient of restitution as well as conservation of energy. The kit consists two bogies having one side with Velcro® pad and other side with spring. Track 1.2m long graduated, pair of support feet, 2 photogate support holders and rods, masses set of 50g, 20g and 10g each.

EBH30774

kit £64.95

Pulley Blocks

Incorporating 50mm diameter plastic pulleys carried in tough plastic frames. The blocks are available in double and triple sheave form with plain bearing pulleys. The bearing pin may be rapidly removed from the frame, thus releasing the pulley(s) and allowing easy 'stringing up'. A simple locking system prevents the pin accidentally coming out. All blocks have a hook at each end. Overall length of frames: 70mm.

B Pulley Single 2 Hooks

EBR06038

each £2.39

C Double Pulley Blocks

EBH30993

each £2.99

D Triple Pulley Blocks

EBH31029

each £4.19

E Newton's Cradle

Teach conservation of momentum in Physics classes around the world. Partially assembled, some assembly required. Size 135 x 115 x 140mm.

EBR05992

each £16.95

F Friction Board Apparatus

Wooden friction board 490 x 75 x 20mm, a wooden slider with hook 140 x 70 x 20mm, a plain aluminium slider and an aluminium slider with rubber backing. A further long aluminium slider is provided which fits over the friction board to provide an alternative surface type.

EBH25110

each £57.95

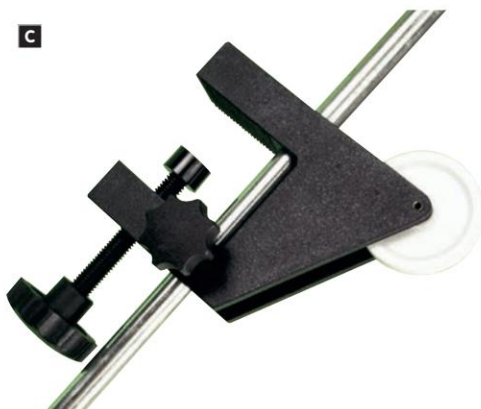
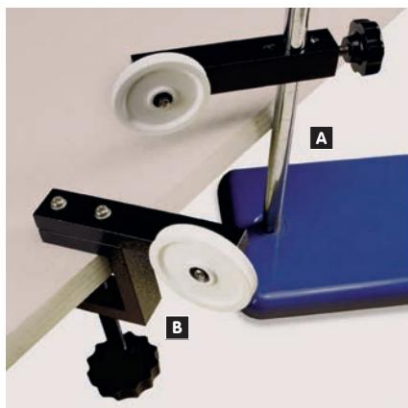
G Inclined Plane and Friction Board

A wooden planed board 600 x 75mm. The board is hinged at one end to a wooden base board and the angle of incline can be fixed in a number of positions by use of a moveable block. Also included is a reversible friction slider (100 x 65mm), one side of which is cut so it has only half the area in contact with the plane to allow various dynamics situations to be explored.

Complete with brass roller 75 x 25mm and pulley wheel but WITHOUT masses or scale pan.

EBH25109

each £47.95

Direct
Delivery**TO ORDER**

Call

INT: +44 (0) 115 907 4001

ROL: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROL: 01 427 3118

A Rod Mounting Pulley

50mm diameter aluminium pulley on an aluminium frame measuring 20 x 20 x 110mm. Frame includes three holes and a clamping screw to accommodate mounting to standard relori stand rods.

Pulleys may be fitted to the frame with its axis of rotation in any one of three planes.

E8H25080each **£12.95****B Clamp Fitting Bench Pulley**

50mm diameter ball bearing plastic pulley. Mounted on an aluminium frame, for clamping to the edge of a bench or force board. The clamp is detachable from the bar carrying the pulley.

Overall length of frame (pulley bar): 110mm.
Maximum clamp opening: 25mm.

E8H25092each **£18.95****C Rod Mounting and Bench Fitting Pulley**

50mm diameter aluminium pulley carried on a plastic frame.

Features:

- Clamp fitting for anchoring to a bench/force board (max. width 30mm)
- Slot with clamping screw to allow attachment to a standard relori stand rod

E8H72446each **£15.95****D Lever Kit**

Supplied as a kit for eight pupils and consists of five plywood beams 600 x 44 x 3mm graduated every 38mm and with a groove across its centre to locate the fulcrum point. Also included are four fulcrums 32 x 32 x 64mm and 40 metal blanks 25mm square. The masses of the blanks are matched to $\pm 1\%$.

Direct Delivery – up to 10 days**E8H25122**kit **£61.95**

Our Own Design

The Linear Air Track provides a convenient way to study laws of motion and different types of collisions. Vehicles can be fitted with interrupt cards, allowing experiments to be greatly enhanced by use of light gates and timing applications to capture data.

Helpful Hint

Help your students explore and understand:

- Velocity and acceleration
 - Newton's laws of motion
 - Elastic and inelastic collisions
 - Conservation of momentum
- In an ideal world, without the problem of friction – they can deal with that in later experiments!

Spares and Accessories

Linear Air Track Accessories

E8L35051

pack £99.95



A Linear Air Track Kit (with Accessories)

Designed for the study of linear motion under virtually frictionless conditions, the Linear Air Track Kit is supplied complete with a range of vehicles and accessories in one integrated package. The concepts of velocity, acceleration can be explored and measured in the absence of friction, and work can be extended to cover conservation of momentum: elastic and inelastic collisions.

The Linear Air Track itself is made from strong, triangular section aluminium. Two rows of fine holes run along the faces of the track through which jets of air emerge to form an air cushion on which the vehicles float under virtually frictionless conditions. The track is supported on three adjustable feet. An air inlet tube is fitted at one end and the air pressure inside the track may be adjusted by the variable control on the Air Track Blower.



The kit includes the Air Track plus the following accessories:

- Track: right triangular section aluminium 60 x 60 x 80mm, overall length 2m
- Nominal height of centre line above bench: 120mm
- Vehicles: two 400g, 250mm x 50 x 5.5mm; one 200g, 230mm x 50 x 2.5mm, their masses are in the ratio 2:1
- Three spring buffers for attachment to the track ends or to vehicles for elastic collisions
- Three 'horns' used with rubber bands for elastic collisions
- Ten spare rubber bands
- Two Magnadur magnets and two counterweights
- A pair of Velcro® buffers for inelastic collisions
- Three black interrupter cards to fit the vehicles for use in timing

E8H25339

each £287.95



B Electric Blower for Linear Air Track

This air blower incorporates continuously variable air velocity control, and has been designed and developed to provide a superior alternative to modified vacuum cleaners. It has many applications and is particularly recommended for use with the Philip Harris Linear Air Track.

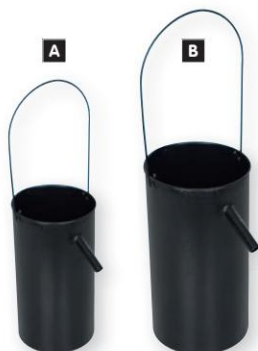
The air blower is supplied complete with hose, hose adaptor and an IEC mains lead with fitted safety plug. For 240V a.c. mains supplies.

E8H25341

each £224.95



B



A Small Displacement Vessel

Mild steel with overflow, for specific gravity experiments.

E8L35816

each **£7.19**

B Large Displacement Vessel

Mild steel displacement vessel with handle and overflow spout.

E8L41282

each **£14.95**

C Fluid Pressure Apparatus (Spouting Cylinder)

To demonstrate that pressure increases with depth. A solid metal cylinder 50mm diameter with three equal size orifices at different heights down one side.

E8L16226

each **£25.95**

D Bourdon Gauge

For the measurement of actual (total) gaseous pressure. Circular gauge, overall diameter 106mm, depth 40mm. The dial reads 0 to 3.4 x 10⁵ Pa actual (total) pressure and the case has a clear Perspex back so that the working parts may be seen. A tubule, 8mm diameter, provides connection to the system under investigation. The gauge is mounted on a heavy base 102 x 102 x 25mm, with rubber feet. Overall height: 220mm.

E8L20035

each **£89.95**

E Boyle's Law Apparatus

Designed for demonstration, the column is clearly visible to the whole class without them having to crowd around the demonstration bench. A wide-bore glass tube is mounted vertically in front of a scale graduated 0 to 65cm. Zero corresponds to the inside of the closed top end of the tube. Air is confined in the tube by a coloured oil contained in a metal pressure chamber which is fitted with a Bourdon-type gauge calibrated 0 to 3.4 x 10⁵ Pa. As the pressure in the oil chamber is increased oil is forced into the glass tube and the volume of the contained air and its actual (total) pressure are directly indicated. The tube is of extra strong glass having a very large safety overload margin. As a further precaution a plastic safety screen is secured over the front. Supplied complete with oil. Overall height: 690mm.

E8H25298

each **£153.95**



Light Red Oil

Direct Delivery - up to 6 weeks

E8A41750

250mL

each **£12.95**

F Boyle's Law (Horizontal Mount)

Designed as a smaller, more economical version of the Standard Boyle's Law Apparatus. The apparatus consists of a horizontally mounted acrylic tube with a graduated scale along one side (scale graduated from 0 to 300cm³). The tube unit is sealed by a standard gas top next to which is mounted a standard pressure gauge. The effective length of the tube is controlled by altering the position of a rubber stopper moved via a screw thread. Users can select the effective length of the tube by positioning the stopper and closing the gas top. The volume of the tube can be read off the scale and printed against the corresponding pressure taken from the gauge. By varying the position of the stopper Boyle's Law can be investigated. This unit has the advantage of not requiring oil to indicate the volume of air. The tube is made out of acrylic which is known to fail 'safely' if punctured.

E8L71663

each **£113.95**

G Tornado in a Bottle

Connect two bottle together one filled with water. Turn the joined bottles upside down, swirl the water round and round, then watch what happens. Only a small amount of water flows into the lower bottle because of the reduced pressure above. By swirling the upper bottle in circles, water begins to pour again and a vortex is created. 20 assorted colours included. Size: D32 x H48mm.

E8R05636

pack 20 **£1.44**





A



B



C



D

A Crushing Can

To show the forces exerted by atmospheric pressure. A light-walled tinplate can, H260 x 75mm diameter, with an air-tight neck and screw cap. A small quantity of water in the can is boiled vigorously until steam occupies the space inside the can, at which point the top is screwed down tightly and the heat source removed. As the can cools down, atmospheric pressure is increasingly exerted until the can noisily collapses.

E8A41798

each £2.89

B Bell in a Bell Jar Experiment

An ideal solution to the common physics experiment demonstrating that sound will not travel in a vacuum. Place the bell jar on the pump plate, briefly connect the power supply. The bell can be heard ringing. Connect the vacuum pump to the pump plate and evacuate as much air as possible. Close the valve, switch off the pump and connect the power again. The bell striker moves but can barely be heard. Open the valve slowly, allowing air back in, and the volume of the bell increases.

The apparatus consists of a sturdy metal base plate mounted on a metal tripod. Baseplate dimensions 200 x 230mm (height x diameter). The bell jar comes complete with an electric bell that requires a suitable d.c. power supply (3–6V). Connection to a power supply is made via two 4mm terminals that protrude from the rubber stopper positioned at the top of the bell jar. Bell jar dimensions 260 x 180mm (height x diameter). Overall mass: 5kg.

E8L11149

kit £70.95

C Jolly's Bulb and Gauge

Palm-sized, hollow metallic ball with a manometer connected to it for demonstrating change of pressure in a closed volume of air when heated or cooled. Immersing the ball in a water bath at a specific temperature allows the relationship between pressure and temperature of the enclosed air to be investigated in order to demonstrate the behaviour of an ideal gas. Approx. 85mm diameter hollow ball.

E8L71651

each £58.95

D Plastic Magdeburg Hemispheres

A traditional demonstration apparatus brought up to date, it consists of two plastic hemispheres with an effective O-ring seal and 6mm plastic valve. When evacuated a force in excess of 1400N is required to separate them. Can be evacuated with Hand Operated Pump.

E8G95051

each £46.95



Designed to enrich and extend the curriculum, STEM club activities involve practical experiments, investigation, discussion and reflection.

They can motivate and build confidence in young people who struggle with STEM subjects, and provide an extra outlet for children who already show aptitude and are interested in furthering their learning.

Most of all, they should be fun!

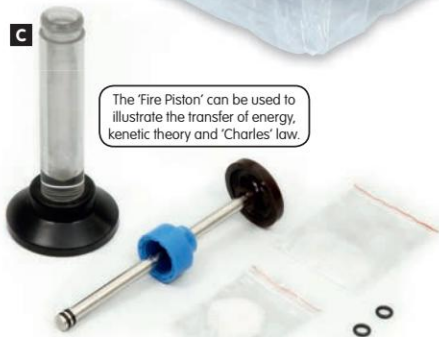


B

A



C



The 'Fire Piston' can be used to illustrate the transfer of energy, kinetic theory and 'Charles' law.

D



Blasts air over 20 feet!



A Plastic Bottle Rocket Kit

Create your own rocket using a plastic bottle and launch it using only water and air. This kit allows you to make a handheld rocket using a 500ml plastic bottle. Use a bicycle pump to pressurise the rocket, the air and water in the bottle will propel it upwards. Contents include a set of cushion parts, 4 fins, 2 rubber bands, a length of double sided tape, a joint part and a launcher unit. Bottle not included. Assembly required.

E8R05343

kit £9.95

B Hovercraft

This self assembly kit uses the force generated by a propeller to hover and travel forward on a cushion of forced air. Contents include two motor base units, motor holder, propeller, motor cover, motor, rubber band, right section, left section, 2 bottom sections, rudder section, body, switch, plastic conductive wire and battery holder, connecting plug, double sided tape set, paper pattern and a plastic bag. Requires 2 AA batteries that are not included. Assembly required.

E8R05344

kit £13.95

C Fire Piston

Compressing the air rapidly with the piston will increase the temperature causing the cotton to ignite. Contents include one cylinder, one piston, two 'o' rings, one cotton cloth and two lots of grease.

E8R05338

each £31.95

D Air Zooka

Whether you're exploring air, vortices, sound waves, or you just want to have fun blasting a puff of air over 20 feet, you'll have plenty of good times with an Airzooka Air Blaster. Here's just a few ideas to get you started. Dimensions: D250 x L365mm.

- "Hi" unsuspecting friends with a blast of air that sends their hair flying
- Blow out a candle from over 15 feet away
- Shoot paper cups off your friend's heads
- Blast bubbles from the sky for target practise
- Fill with smoke from a fog machine and make huge smoke rings

E8R05621

each £25.95

A Cubes for Density Investigation

Cubes for density investigation, 20mm.

E8H25146	Aluminium	pack 5	£7.79
E8H25158	Brass	pack 5	£10.95
E8H25169	Copper	pack 5	£13.95
E8H25171	Steel	pack 5	£15.95
E8H25183	Lead	pack 5	£9.59
E8A41324	Stone	pack 5	£8.39
E8H25195	Plastic	pack 5	£8.39
E8L78141	Set of all Materials	set 7	£119.95

B Metal Blocks

For density determinations. The set comprises two each of brass, iron, aluminium, copper, zinc and lead. Masses vary from 12 to 25g approx.

E8H25201 set 12 **£75.95****C Hooke's Law Apparatus**

To demonstrate that the relationship between the extension on a spring is proportional to the load applied to it. The apparatus consists of a high quality, moveable, 120mm scale that is mounted on a simple stand and base.

A combined mass hanger/pointer is provided and is connected to the suspended spring to allow easy reference to the scale. Dimensions: D100mm x H250mm.

Direct Delivery – up to 10 days**E8L23735** each **£64.95****D Expendable Steel Springs**

Dimensions of coiled portion D16 x L20mm. Overall closed length including end loops 50mm. Coils open at 20g load and extend to approx. 60mm at 100g load. Max. extension without permanent deformation is approx. 150mm.

E8A41397 pack 100 **£11.95****Expendable Steel Springs Long Extension**

The coiled portion is D15.5 x L20mm. Overall length 55mm wire diameter 0.7mm. Coils open at 20g with an extension of approximately 40mm for 100g load. Maximum extension without deformation is approx. 450mm.

E8G87194 pack 100 **£11.95****E Young's Modulus Apparatus**

Comprises a scale plate carrying a 0 to 30mm scale, and a moveable vernier readable to 0.1mm. Both have bars with clamping screws for the wires and hooks for the tension weight and loading masses. A ceiling clamp is provided for the upper ends of the wires, together with a pair of large woodscrews for attaching it to a convenient overhead beam, door frame etc. A tension weight, mass 1.3kg approx. for the comparison wire is also included. Supplied WITH-OUT load masses or wires.

E8H25213 each **£106.95****Wires for Young's Modulus**

Contains 1 each of: 0.90mm bare copper, 0.71mm bare brass, 0.90mm bare brass, 0.56mm stainless steel, 0.71mm stainless steel, 0.90mm stainless steel. All 125g reels.

E8R06010 pack 6 **£40.95****F Ball Bearings**

High quality steel ball bearings, available in 3 sizes.

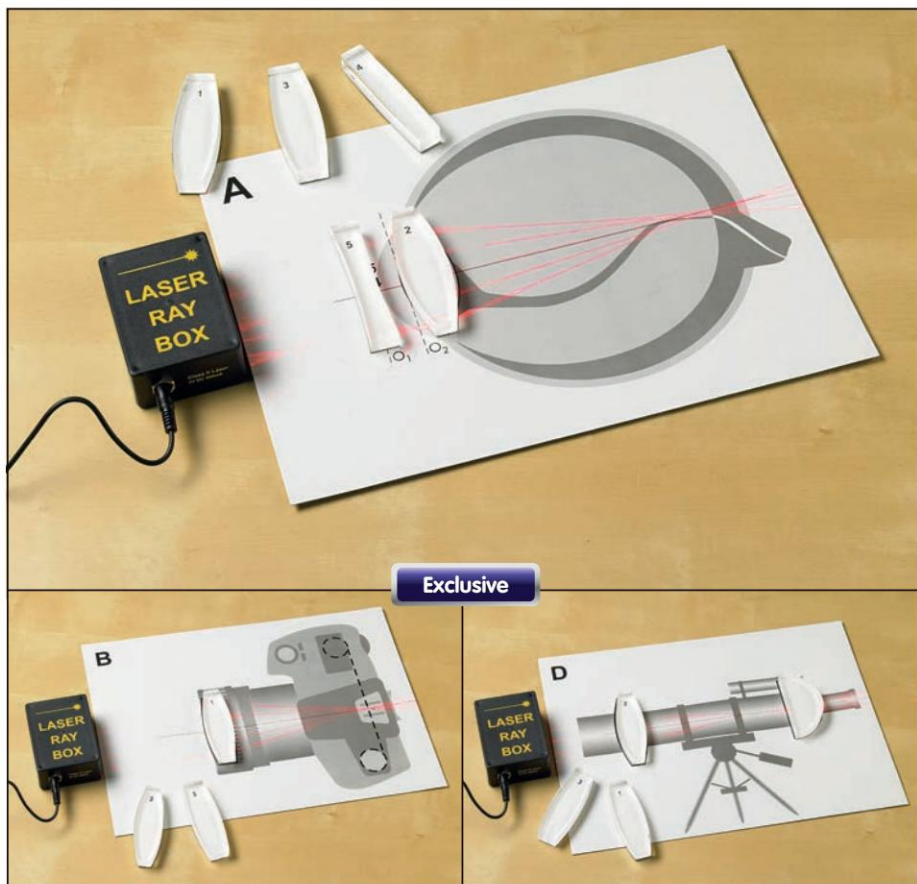
E8R05984 25mm pack 5 **£9.59****E8R05985** 13mm pack 10 **£5.09****E8R05986** 3mm pack 50 **£4.79****G Expendable Steel Springs Extension**

D37 x L25mm excluding loops, 58mm long overall. Wire diameter 1.5mm. Load required to just open coils 50g approx. Further 100g increments each increase spring length by 15mm approx. Max. recommended load 1.5kg.

E8A41415 pack 10 **£8.39****H Set of Springs**

An assortment of 180 compression and extension springs ranging from: 11 to 300mm in length, 3 to 15mm in diameter and 32 s.w.g. to 16 s.w.g. in wire thickness.

E8A81989 set 180 **£51.95**



Exclusive

Ray Optics with Laser Ray Box

An exciting way to learn about optics by building and exploring common optical systems.

The Laser Ray Box emits five red laser streaks across any flat surface it is placed on. The Ray Box is magnetic so it can stick to some whiteboards. This kit can be used in normal room lighting, or reduced light. Blackout is NOT necessary. Add a work card (also magnetised) and you have the outline of an optical device. Choose from: an eye, a simple camera, a Galilean refracting telescope (opera glass), a modern refracting telescope, a wide angle lens and a large protractor for general work on reflection and refraction.

Outlines and numbers on each workcard guide students to choose suitable optical items (magnetic of course!) from the shaped storage case, to complete the optical device and reveal the path of light rays through the various components. Components can easily be moved and changed to explore the phenomena of long and short sight, see how spectacle lenses provide correction, understand how a camera or telescope creates a focused image, investigate refraction and calculate refractive indices.

All the optical items can be used individually for teacher-designed investigations.

Contents:

- Laser Ray Box and plugtop mains adaptor (5V)
 - 6 laminated magnetic workcards, approx 400 x 280mm
 - 6 acrylic lenses, 5 numbered for identification
 - 3 mirrors: plane, convex and concave
 - 2 semicircular blocks/lenses
 - 1 right angle prism
 - 1 rectangular block
 - 1 straight "light pipe"
 - 5V plug top power supply for LED lines
- Sizes: Optical Items and Workcards 430 x 350 x 60mm, mass 1.72kg.
Laser Ray Box 100 x 75 x 40mm, mass 250g.

EBR03098

kit £263.95

CROSS REFERENCE

Economy Human Eye Model see page 57



A Ray Optics Kit

A versatile kit of components for ray optics experiments. Investigations possible include linear propagation of light rays, focusing of rays by cylindrical lenses, focusing of multiple rays showing aberration, law of reflection, refraction in water, prisms, etc.

Contents:

- 2 lamps and stands
- 1 pair of housing shields
- 2 combined single and triple slit plates
- 2 multiple slit combs
- 2 holders for combs and slit plates
- 4 wooden light barriers
- 4 plano cylindrical lenses +7D
- 2 plano cylindrical lenses +10D
- 2 plano cylindrical lenses +17D
- 2 plano cylindrical lenses 17D

E8H25857

pack £219.95

B Lamp and Stand

Comprising a 12V 24W lamp in a conical lamphouse mounted on an adjustable boss. The lamphouse has cut-outs in its side giving a clear passage for the light while restricting the amount of stray illumination. The assembly is supported on a rod with a triangular cast base. Triangular base: 100mm side x 28mm high. Overall height of stand: 240mm. Supplied with lamp and lead with 4mm plugs.

E8H76828

each £69.95

C Compact Light Source

A very efficient 12V 100W quartz iodine lamp in a ventilated metal housing. 19mm diameter apertures on two adjacent sides allow the lamp to be used either as an intense horizontal 'line' source, or end-on as a powerful 'point' source. The aperture not in use may be closed by a pivoted shutter. The lamphouse is mounted on a rod 160mm long x 10mm diameter for supporting from an ordinary laboratory stand.

Dimensions of lamphouse: 78 x 78 x 153mm. Supplied with twin 4mm leads. (Power supply not included).

E8H76839

each £149.95



CROSS REFERENCE

Quartz Iodine Projector Bulb see page 463

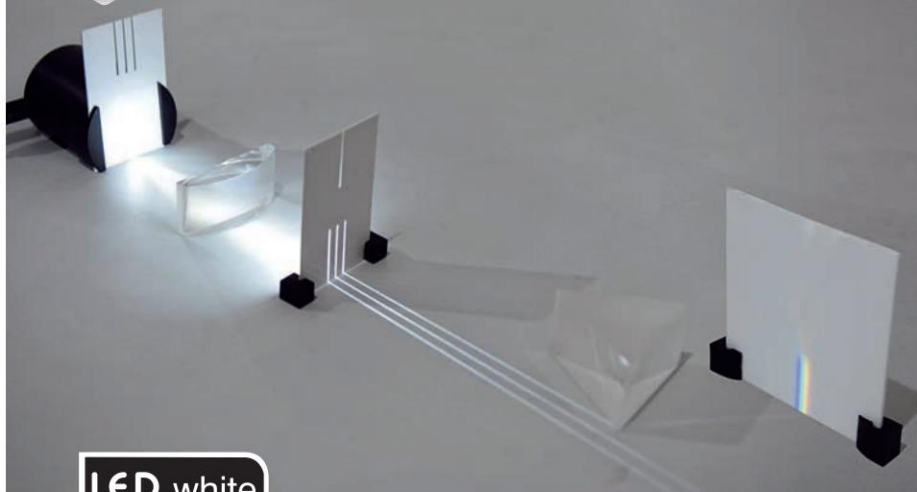


A

Great Value

Exclusive

Our Own Design



LED.white

B



C



A LED.white Experiment Kit

The accessory kit complements the LED.white and includes:

- Collimating lens
- Slit plate and holder
- Mounting rod to enable use with the optics benches
- 2x Spectrometer Prism (EDF)
- Experimental guide suggesting experiments that can be performed

E8L87359

set **£89.95**

B LED.white

- No blackout required
 - Excellent alternative to traditional rayboxes
 - Gives a better white than conventional lamps
 - Powered by a 5V plugtop (supplied)
 - Long life, low power LED (1 watt 10,000 hours) instead of a 24/36W bulb
 - Runs cooler than traditional ray optics boxes
 - Voltage cannot be 'accidentally' increased and blow the bulb
 - Improved design with integral slit plate holder
- LED white can be used in most experiments in place of a ray box and offers many advantages. Spectra produced using prisms or diffraction gratings are bright and clear, from red through to violet. It can be mounted on a retort stand or optics bench using the mounting rod in the LED.white experiment kit. Includes an experiment guide on CD.

E8L87348

each **£71.95**

C Coloured Acetate

A4 sheets of acetate in red, yellow, green and blue. The sheets are easily cut to make filters for colour experiments. Pack of 20.

E8R05668

each **£21.95**

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



Our Own Design

Spares and Accessories

Low Voltage Bulbs - 38mm

With straight axial filament, double contact, S.B.C. Dimensions 55 x 38mm diameter approx. For Philip Harris Ray Optics Box B8H77468.

E8A56820 12V 24W each **£1.56**

Festoon Lamp 12v

12v Festoon Lamp suitable for the Economy Science Ray Optics Box B8H77390.

E8A91753 each **£1.99**

Collimating Lens for Ray Box

Spare collimating lens for Ray Optics Boxes.

E8G98635 pack 5 **£15.95**

Slit Plate for Low Cost Ray Box

Spare slit plates for Economy Science Ray Optics Box B8H77390. 45mm x 75mm. Suitable to be used with both the Ray Optics Box and Battery Operated Ray Optics Box.

E8G98647 pack 5 **£3.89**

Spare Slit Plates

Spare slit plates for Philip Harris Ray Optics Box B8H77468. 50mm x 100mm.

E8L26955 pack 5 **£10.95**

Spare Lens

Spare 50mm double convex cylindrical lens for Philip Harris Ray Optics Box B8H77468.

E8R01336 each **£10.95**

**A Ray Optics Box**

A ventilated Ray Optics box open fronted with extended sides finned externally for heat dissipation and vertical internal grooves to accommodate a slit plate and cylindrical lens. It includes a 12 volt, 21 watts lamp with one meter of twin flex ending in 4mm connectors, a single and triple slit, whittened on one side, black matt on the other. Operates on 12 volts power supply which is not included.

E8R06342 each **£37.95**

B Battery Operated Ray Optics Box

A battery operated LED Ray Box comprising of a die cast enclosure which delivers white light but runs much cooler than conventional incandescent lamp models. It uses the latest cool ultra bright LED technology giving superior white light. Supplied complete with slit plate and its own battery power source using 2 x AA size batteries (not supplied).

E8R06343 each **£67.95**



Light Box And Optical Set

A set of optical apparatus for all types of optical experiment involving reflection, refraction and colour mixing. The principal component is a robust light box finished in matt black with a 12V halogen lamp with 0.75m of twin flex. One end of the box has a cylindrical convex lens in an adjustable sliding mount which allows a parallel, convergent or divergent beam to be produced. The other end of the box has a triple aperture system for colour mixing experiments, the lateral apertures having adjustable hinged mirrors. All apertures in the box are provided with vertical channels to hold slit plates and/or colour filters.

Optical accessories included:

- Perspex blocks (prisms): One rectangular, one semi-circular, one triangular prism $60^\circ \times 60^\circ \times 60^\circ$, one triangular prism $90^\circ \times 60^\circ \times 30^\circ$, one triangular prism $90^\circ \times 45^\circ \times 45^\circ$
- Cylindrical perspex lenses: One double concave, one double convex (both with the same radius of curvature), one thick double convex
- Mirrors: One curved metallised plastic (parabolic), one curved metallised plastic (semi-circular), one plane glass (mounted on stand)
- Black plastic slit plates: One with three narrow slits and one narrow slit, one with four narrow slits and one wide slit
- Set of eight colour filters: Primary red, primary green, primary blue, cyan, violet, yellow, orange and magenta
- Set of eight coloured cards: Red, green, blue, violet, orange, cyan, yellow, pink

The set is supplied complete with a spare lamp and a detailed instruction manual.

Dimensions of light box: 170 x 90 x 55mm.

E8A44106

set £66.95

Spares and Accessories

Set of Slit Plates

Spare slit plates for the Light Box and Optical Set.

E8A44222 pair £4.79

Light Box Only

The bare light box, with formers for a collimating lens and slit plates.

E8A44271 each £79.95

Spare Halogen Bulb

12V, 20W.

E8R02149 each £3.89

Low Voltage Bulbs

With straight axial filament; double contact; S.B.C. Dimensions 55 x 38mm diameter approx.

E8R01296 12V 36W each £1.99



CROSS REFERENCE

Bench Power Unit see page 386

A LED modulator

The LED modulator is designed to modulate the intensity of the LED laser or LED white with an analogue signal. Signal is input via either a pair of 4mm sockets (for example – from a signal generator), or a 3.5mm audio jack, for connection to an MP3 player or other audio source. A 1MHz internal generator is also available that allows direct measurement of the speed of light, when used with the LED laser and a dual trace oscilloscope. Input selection is via a control panel, and is indicated via an LCD.

A captive driver lead delivers power and signal to the light source of choice, and a BNC socket allows the output signal to be observed on an oscilloscope simultaneously.

As the unit modulates the power to the light source, a power supply is not required – simply use the LED laser or LED white's own plug-top supply.

Note: 4mm plug leads or a 3.5mm plug-to-plug lead is required to connect the signal source, and a BNC plug-to-plug lead is required to view the signal on an oscilloscope. An experiment guide is included on CD.

EBR04837each **£113.95****B LED strobe**

The LED strobe produces a square wave signal, whose frequency can be varied from 1-200Hz in 1Hz steps, and whose duty cycle can be set between 10 and 50% in 5% steps.

The square wave is used to modulate the power to the LED white or LED laser (not included), allowing them to be used in experiments involving stroboscopy.

With the LED white, the fast moving objects can be slowed down or frozen, allowing easy observation of motion, and discussion of the uses and effects of a strobe.

Interesting patterns can be projected by using the LED strobe with the LED laser.

As well as internal modulation, the unit has 2 x 4mm sockets for triggering from an external source, such as a signal generator or audio.

Control of the frequency and duty cycle is via a keypad, and settings are indicated via an LCD.

As the unit modulates the power to the light source, a power supply is not required – simply use the LED laser or LED white's own plug-top supply.

An experiment guide is included on CD.

EBR04838each **£113.95****C LED Rx**

The LED Rx is used to receive and demodulate light from the LED laser or LED white, which has been modulated using the LED modulator.

The light is collected by a phototransistor on the front of the unit, which is white for easy aiming of the laser beam over greater distances.

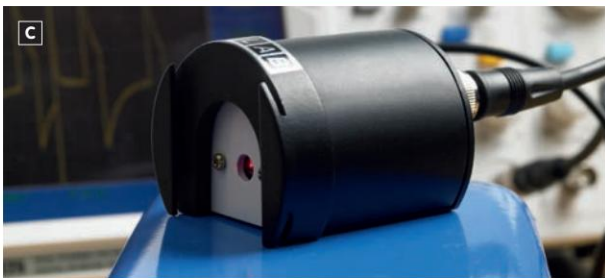
A BNC socket at the back outputs the demodulated signal. When connected to an audio amplifier, the signal carried by the laser can be heard. Alternatively, the signal can be observed on an oscilloscope.

The LED Rx responds to the 1MHz signal produced by the LED modulator, and by comparing the source and received signals on a dual-trace oscilloscope, it is possible to measure the speed of light.

It is housed in a convenient flat-bottomed cylindrical housing for work on the bench, and a boss on the back allows mounting on a retort rod.

Note: a BNC plug-to-plug lead is required for connection to an oscilloscope.

A plug-top power supply and an experiment guide are included.

EBR04836each **£88.95****D LED laser**

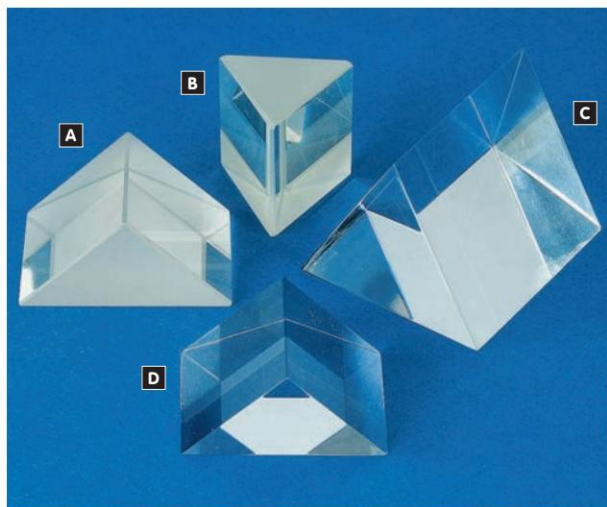
Used on its own, the LED laser can be used to investigate reflection, refraction, diffraction and interference.

It can also be driven by the new LED modulator, which allows the intensity to be modulated with an analogue signal. The signal can then be received with the LED Rx, which can demodulate the signal for output to an audio amplifier or oscilloscope. By modulating with a 1MHz signal, the speed of light can be measured directly.

The laser has a convenient flat-bottomed cylindrical housing for work on the bench, and a boss on the back allows mounting on a retort rod.

The wavelength is 640nm, and is a class II unit with a power output of <1mW. A plug-top power supply and an experiment guide are included.

EBR04839each **£65.95**



Info

GLASS PRISMS

All glass prisms are optically polished and made from white optical glass.

A Clear Glass Prism

90° x 45° x 45°. Refractive index 1.52 approx. Polished faces.

	Hypotenuse x length	each
E8A45615	35 x 25mm	£4.19
E8A45627	70 x 50mm	£10.95

Spectrometer Prism; Extra Dense Flint

90° x 45° x 45°. Extra dense flint glass, refractive index 1.7 approx. 2 faces optically polished.

	Hypotenuse x length	each
E8A46413	45 x 32mm	£14.95

B Clear Glass Prism

60° x 60° x 60°. Refractive index 1.52 approx. Polished faces.

	Length	Face	each
E8A45585	25mm	25mm	£3.89
E8A45597	38mm	38mm	£4.39
E8A45603	63mm	63mm	£25.95

C Perspex Prism

60° x 60° x 60° Clear perspex, polished surfaces.

	Length	Face	each
E8A45640	63mm	38mm	£4.39
E8A45639	38mm	63mm	£3.89

D Perspex Prism

90° x 45° x 45° All faces fully polished.

	Hypotenuse x length	each
E8A45652	35 x 25mm	£2.99

E Light Guide Demonstrator

For showing how the phenomenon of total internal reflection may be used to confine light within a guide or fibre, thus leading to an appreciation of the principles of optical communications.

Comprising an acrylic bar 220 x 20 x 20mm, formed into a shallow 'S' shape. Whilst the shape of the bar prevents the direct passage of a light ray, if such a ray (from a light box or laser) is introduced into one end, it can be seen to be reflected several times, from the internal surfaces of the bar, to emerge from the other end. The lower surface of the bar is painted white to aid visibility of the path of the light ray.

E8A45688	each	£42.95
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F LED.white and Light Guide Demonstrator

The LED.white is a superb alternative to the traditional raybox. It can be used in most experiments in place of a ray box and offers a number of advantages:

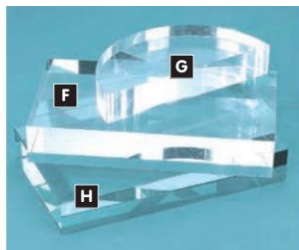
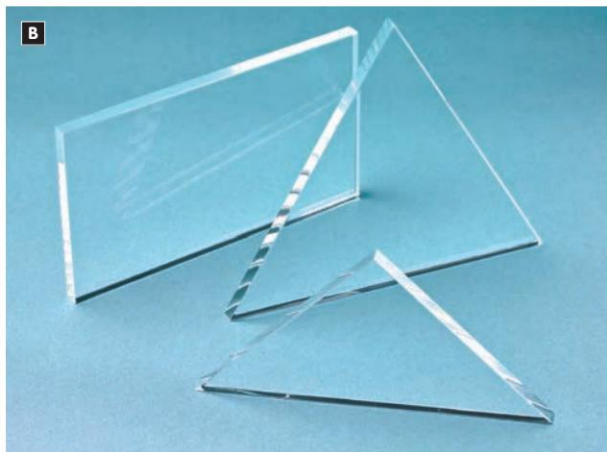
- Purer white light compared to the traditional ray optics boxes
- No additional power supply required (5V plug top included)
- Uses less power (1W LED rather than 24/36W bulb) and is much cooler than traditional ray optics boxes
- Much longer life (approx. 100,000 hours) than filament bulbs and because of plug top PSU the voltage can not be 'accidentally' increased to blow the bulb
- Can be mounted on a retort stand using the incorporated boss

Contents: Experiment guide on CD, LED.white, Light guide demonstrator, power supply, slit plate and slit plate holder. The LED.white and Light Guide Demonstrator can also be bought separately.

E8R00001

kit **£102.95**





A Acrylic Blocks

Explore the way light is bent and changed as it passes through a rectangle, a semi-circle, 2 lens shapes - concave and convex - or 1 of 3 triangle prisms. Leave them on the 'widdling table' with a torch and see what your pupils discover. 25mm thick. Set of 7 supplied in a storage tray.

E8A45494

set 7 £18.95

B Acrylic Blocks - Large

Ideal for demonstration purposes where standard size items may be considered inconveniently small. This set consists of a rectangular block, 190 x 110mm; an equilateral triangular prism, side length 190mm; and a right angled triangular prism, hypotenuse length 185mm. All are fully polished, 10mm thick.

E8A45573

set 3 £13.95

C Adjustable Lens Holder

Plastic, adjustable lens holder to accommodate a range of lens sizes.

E8R03178

each £7.79

D Lens Holder, Mounted

Designed to hold lenses or mirrors of 50mm diameter. Comprises a strip metal spring clip with a locating 'V' in either side arm, mounted on a stand with a groove across the base to accommodate a metre rule.

E8H25959

each £3.99

E Lens Holder, Unmounted

Comprising a metal holder with sides grooved to hold the lens or mirror. The holder is finished in matt black and is free standing for bench use. Designed to hold lenses or mirrors of 50mm diameter.

E8H25948

each £3.59

F Rectangular Perspex Block

Clear Perspex, all faces fully polished. Dimensions: 115 x 65 x 20mm.

E8A45457

each £7.49

G Semi-Circular Perspex Block

Clear Perspex, all faces fully polished. Size: 90 x 16mm, diameter x thickness.

E8A45470

each £4.29

H Rectangular Glass Block

High quality glass with optically worked surfaces. All angles accurately worked. Dimensions: 114 x 65 x 19mm.

E8A45445

each £8.99



A Plano-Cylindrical Lenses

Clear glass with ground ends and optically worked faces. 50 x 50mm. Suitable for use with ray optics kit.

	Power, dioptres	pack 5
E8L27297	+7	£19.95
E8L27303	+10	£21.95

B Half-Size Plano-Cylindrical Lenses

Plano-cylindrical lenses, clear glass with ground edges and optically worked faces, 50 x 22mm high. Suitable for use with ray optics kit.

All experiments carried out with full height lenses may be performed with half-size lenses.

	Power, dioptres	pack 5
E8L27339	+7	£11.95
E8L27340	+10	£15.95

C Spherical, Double Convex Lenses

Optically worked faces; ground edges; refractive index: 1.52.

	Focal length	Diameter	Power	pack 5
E8L27108	50mm	38mm	+20D	£7.89
E8L27145	50mm	50mm	+20D	£7.29
E8L27157	100mm	50mm	+10D	£7.19
E8L27169	150mm	50mm	+6.6D	£7.19
E8L27170	200mm	50mm	+5D	£7.19
E8L27194	300mm	50mm	+3.3D	£7.19
E8L27200	500mm	50mm	+2D	£7.19

D Spherical, Double Concave Lenses

Optically worked faces; ground edges; refractive index: 1.52.

	Focal length	Diameter	Power	pack 5
E8L27236	50mm	50mm	-20D	£8.09
E8L27248	100mm	50mm	-10D	£7.19
E8L27259	150mm	50mm	-6.6D	£7.19
E8L27261	200mm	50mm	-5D	£7.19

E Plano Convex Lenses

Optically worked faces; ground edges; refractive index: 1.52.

	Focal length	Diameter	Power	pack 5
E8L27273	140mm	50mm	+7D	£7.19

Practical Information

LENSES

All lenses are optically polished and made from white optical glass.

**A Mounted Plane Mirror, Glass**

Silvered back with protective coating, mounted on wooden block 20mm thick approximately.

Direct Delivery – up to 10 days

	Size	each
E8A44611	75 x 25mm	£7.59
E8A44623	100 x 75mm	£9.59

B Unmounted Plane Mirrors, Glass

Back silvered with protective coating.

	Size	pack 10
E8A44556	75 x 25mm	£1.32
E8A44579	100 x 75mm	£3.09
E8A44581	150 x 50mm	£2.79

C Convex Glass Mirrors

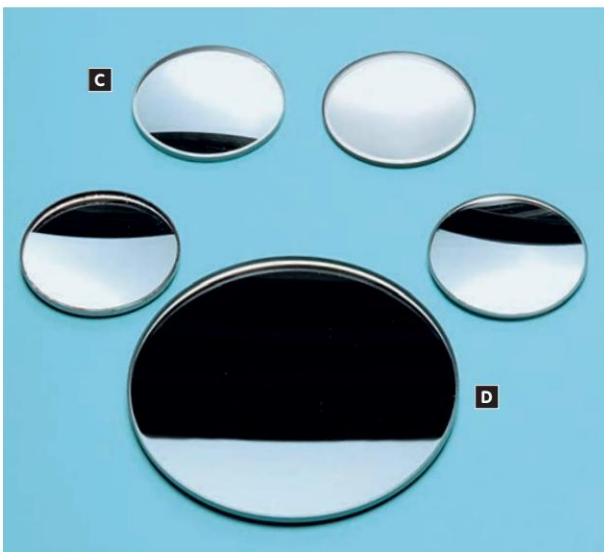
Optically worked, silvered back with protective coating.

	Diameter	Focus	pack 5
E8L27558	50mm	100mm	£8.79
E8L27569	50mm	200mm	£8.49

D Concave Mirrors, Glass

Optically worked, silvered back with protective coating.

	Diameter	Focus	pack 5
E8L27066	50mm	100mm	£8.79
E8L27089	50mm	200mm	£8.59
E8R05109	100mm	1000mm	£17.95



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www.findel-international.com



Plastic Flexible Mirrors

Ideal for use by children, these mirrors are flexible, unbreakable and can be cut into different shapes. They can be taped together for multiple reflections. Both sides are covered with a protective film.

A 75 x 25mm

E8A44404

pack 10 **£1.33**

B 100 x 100mm

E8A44428

pack 10 **£5.49**

C 100 x 75mm

E8A44416

pack 10 **£4.79**

D Concave/Convex Double-Sided Mirrors

Flexible metallised plastic double-sided plane mirrors. Whilst being very strong, the mirrors may be easily subdivided with a sharp knife. Thickness 0.75mm.

E8A44453

100 x 100mm

pack 10 **£5.49**

E8A44439

150 x 100mm

pack 10 **£10.95**

E Symmetry Mirror

A simple but effective device for demonstrating the symmetrical nature of plane surface reflection. It consists of a tinted Perspex screen, 150 x 100mm, provided with side supports.

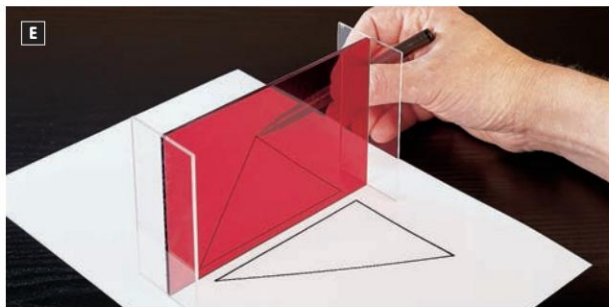
E8A44891

each **£2.19**

F Plastic Circular Mirrors

A range of robust, large circular mirrors, all with a high quality optical finish.

	Type	Diameter	each
E8A44489	Combination	300mm	£14.95
E8A44520	Convex	305mm	£13.95



CROSS REFERENCE

Philip Harris Roy Optics Box see page 273

TO ORDER

Call

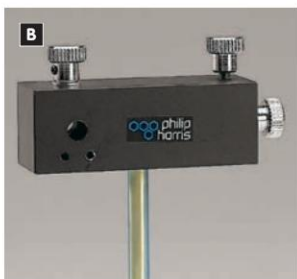
INT: **+44 (0) 115 907 4001**

ROI: **01 427 3100**

Fax

INT: **+44 (0) 115 907 4002**

ROI: **01 427 3118**



A Laser Accessory Set

A set of compatible items which will enable diffraction to be investigated with slits, gratings, pinhole spots and other obstacles. The set comprises:

- 1 Set of six lenses, focal lengths -100, -50, +50, +100, +200 and +1000mm
- 3 Lens holders
- 1 Slide holder for 50mm square slides
- 1 Pinhole slide, 50mm square, with holes of 0.2, 0.1 and 0.05mm
- 1 Slide with single and double slits
- Set of six slides with 1, 2, 3, 4, 5, and 6 slits respectively
- 1 Set of three diffraction grating slides of 150 and 300 lines
- 1 Air cell for refractive index of gases. Path length 75mm approx.
- 2 Microscope slides 76 x 25mm
- 1 Glass scale 200 x 25 x 6mm, scale 0 to 150 mm x 1mm
- 1 Support stand for glass scale
- 1 Slide, 50mm square with circular obstacles for Fresnel diffraction
- 6 Bead headed mapping pins and needle for Fresnel diffraction
- 1 Hologram (ready prepared)
- 1 Copy of Manual of School Laser Demonstrations

Direct Delivery – up to 4 weeks

E8H26151

set **£346.95**

B Beam Splitter

For splitting a light beam (especially a laser beam) into two equally intense beams. Comprises a pair of mirrors arranged in a periscope configuration. One mirror is semi-silvered to transmit half the light and reflect the other half on to the second mirror. An adjustment is provided to

vary the horizontal separation of beams from 18 to 45mm approximately, and another adjustment gives rotation of the one mirror through an angle of 20°. Mounted in a 25mm square section tube with 6mm diameter peg to fit Philip Harris optical stands.

Overall length: 90mm. Supplied complete with a copy of Manual of School Laser Experiments but WITHOUT stand.

E8H26163

each **£131.95**

C Diffraction Slide

Comprises a card mount 90 x 40mm approximately with three 16 x 9mm apertures, each containing a diffraction grating replica.

E8A46231

each **£24.95**

D Newton's Rings Apparatus

For the measurement of the wavelength of light by the reflected system. Comprising a frame 60 x 58 x 50mm high with a glass plate, 56 x 47 x 3mm, mounted at an angle of 45° to reflect the light downwards on to a plano-convex lens, 32mm diameter x 1m focus, which rests on a plane glass plate, 38 x 38 x 3mm, on the base of the box. Complete with lens.

Direct Delivery – up to 10 days

E8A46229

each **£46.95**

E Gratings and Slits

Set of nine slides in 50 x 50mm mounts, six of them having a series of slits, numbering from 1 to 6, each slit approximately 0.0625mm wide and separations between slit centres of 0.25mm. The other three slides are coarse gratings with the following features:

- 150 slits with the same width and separation as the multiple slits above

- 150 slits, half the width but with the same separation
- 300 slits, half the width and half the separation

Direct Delivery – up to 10 days

E8H26175

set **£73.95**

F Polaroid Film

Bonded between thin clear sheets of flexible plastic. Maximum transmission single plate 32%. Extinction transmission 0.005%.

Direct Delivery – up to 10 days

E8A46358

50 x 50mm

pair **£23.95**

E8A46369

150 x 150mm

each **£76.95**

Spares
and
Accessories

Diffraction Grating

In 50 x 50mm mounts.

E8A46279

300 lines/mm

each **£15.95**

E8A46280

600 lines/mm

each **£19.95**

Slit Slides

E8R06222

Single

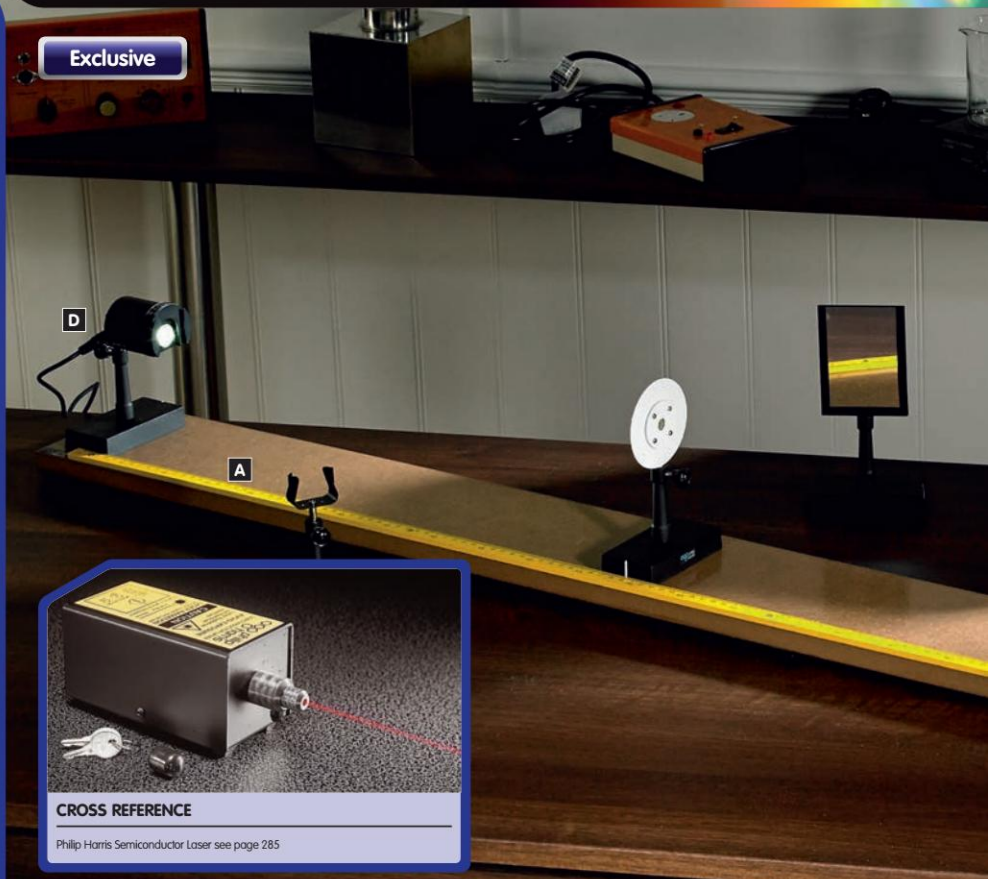
each **£11.95**

E8R06223

Double

each **£11.95**

Exclusive



CROSS REFERENCE

Philip Harris Semiconductor Laser see page 285

An excellent low-cost resource for an introduction to the study of optics, the wooden optical bench is a versatile piece of apparatus with a wide range of available accessories. Using a lens holder and a screen, the powers of different lenses can be measured and real and virtual images discussed. By mounting a laser, ray optics can be investigated, and phenomena such as interference patterns can be observed with the Young's Slits accessory.

A Optical Bench, Wooden, 1.5m

Wooden baseboard 1.6m x 140mm with a 1.5m scale divided in mm plus six sliding moulded bases 100 x 50mm each with index line, brass pillar and locking screw. The following accessories are included:

- 1 lamphouse with a white 240V lamp LED
- 1 white metal object screen 75mm in diameter with gauze
- 1 holder for lenses, 38mm diameter
- 1 white metal receiving screen, 100 x 75mm with a slot for squared paper screen on the reverse
- 1 object needle mounted in 6mm brass rod
- 1 Plane mirror in a metal frame 100 x 75mm

Each of the accessories is mounted on a 6mm brass rod which fits into the stands giving an optical height 125mm above the base board.

E8H89963

each £171.95

B Young's Slits

Photographically reproduced double slit 10mm long x 1mm separation protected by glass plates and framed in a 50 x 50mm mount.

E8H26138

each £15.95

C Stand for Lens Holder

Metal pillar with clamping screw to support rods of 6mm diameter as used on standard optical bench fittings. Base dimensions: 100 x 50mm.

E8H26102

each £17.95

D LED, white

- No blackout required
- Excellent alternative to traditional rayboxes
- Gives a better white than conventional lamps
- Powered by a 5V plugtop (supplied)
- Long life, low power LED (1 watt 10,000 hours) instead of a 24/36W bulb
- Runs cooler than traditional ray optics boxes
- Voltage cannot be 'accidentally' increased and blow the bulb
- Improved design with integral slit plate holder

LED white can be used in most experiments in place of a ray box and offers many advantages. Spectra produced using prisms or diffraction gratings are bright and clear, from red through to violet. It can be mounted on a retort stand or optics bench using the mounting rod in the LED white experiment kit. Includes an experiment guide on CD.

E8L87348

each £71.95

**E Lamp, 12V**

Uses 12V 24W 5.B.C. projection lamp with lead and 4mm plugs.

E8H76580 each **£13.95**

Lens Holder, Clip Pattern

Designed to provide a firm grip on 38mm diameter lenses.

E8H25997 each **£11.95**

F Holder for Diffraction Objects

Rectangular metal frame with spring clips and a mounting rod. Dimensions: 105 x 55 x 10mm.

E8H26011 each **£23.95**

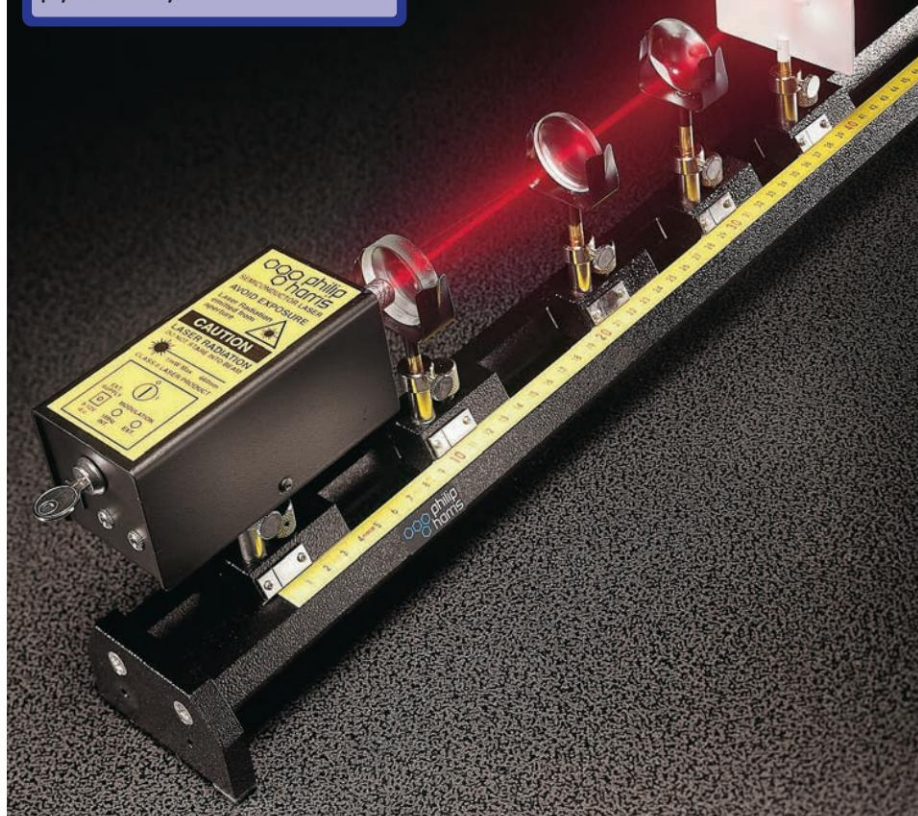
G Lens Holder, Adjustable, Simple Pattern

V-section with hinged arms to take any lens or mirror up to 75mm diameter.

E8H26009 each **£19.95**



Bring a comprehensive optics kit to your lab with this premium optical bench. Mount a semiconductor laser to study interference and diffraction, or use an incandescent lamp to explore lenses and the images they create. Designed to be lightweight and robust, the optical bench is a valuable asset for any physics laboratory.



Optical Bench with rail, 1.5 Metre

The optical bench is a high quality product for precise work, consisting of a 1.5 meter rail in which carriages are secured and a precision scale. Five carriages are included, for which there are a range of accessories available. Experiments can be done using either the Philip Harris semiconductor laser, or the lamp accessory. Also included are two offset bosses for mounting accessories off centre for experiments involving bending of light etc.

It has been designed with robustness in mind, with durable feet at each end and an adjustable central support prevents "sag". Each carriage is secured between two strong hexagonal rods, which form a V-shape ensuring stability. The rods are of aluminium alloy, and are anodised for a durable finish.

Supplied with five carriages and two offset bosses, but WITHOUT accessories.

Overall length of bench: 164cm.

Scale: 150cm with 1mm divisions.

E8H25961

each £259.95

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QUOTATION
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Exclusive

Our Own Design

A Philip Harris Semiconductor Laser

A compact fully solid state instrument which produces an intense beam of light at a wavelength of 630nm and can be mounted directly upon a standard type optical bench. An adjustable collimator is incorporated providing focusing facilities and control over beam divergence. A useful feature is the modulation facility which permits experiments in laser communications and speed of light investigations to be carried out. Modulation may be by means of the built-in oscillator, or from an external signal source. For these applications an accessory receiver unit is available. A key operated ON/OFF switch is incorporated. (Please contact customer services if a spare key is required).

- Power output: 0.9mW nominal, 1mW absolute maximum
- Category Class: 2 with Wavelength 630nm
- Beam divergence: 1 mrad approx. at optimum focus
- Modulation capability: Analogue or digital
- Internal modulation: pulsed at 1MHz, pulse width 0.1µs
- External modulation: 1V peak to peak max., 100Hz to 1MHz, input impedance 50Ω
- Modulation input connectors: 3.5mm jack sockets
- Operating voltage: 8 to 12V d.c. from internal PP3 type battery (alkaline recommended), and from smoother and regulated source via 'power in' socket
- Current consumption: 50mA typical, giving approximately 9 hours operation from alkaline PP3
- Dimensions: 160 x 65 x 72mm overall (including collimator)
- Mass: 400g

E8A46139

each £259.95

B Modulated Laser Receiver Unit

For demonstrating the transmission of information via a modulated laser beam, and for simple speed of light determinations. It includes a self contained receiver unit comprising an opto-detector coupled to a wide band amplifier.

A miniature speaker is incorporated to provide an audible signal from modulation frequencies within the audio frequency range, although if 'demonstration level' volume is required, a separate amplifier/speaker system is recommended. Powered by a 9V PP3 battery, ON/OFF switch incorporated.

- Frequency response (opto-detector/amplifier): 100Hz to 5MHz
- Dimensions: 120 x 65 x 35mm

E8A46176

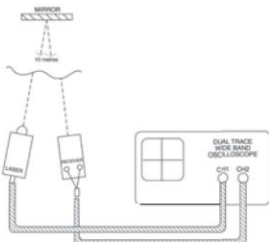
each £78.95

**SIMPLE SPEED OF LIGHT EXPERIMENT**

Helpful Hint

1. Arrange the individual items as shown in the diagram. The mirror should be located at least 10 metres away from the laser/receiver set-up. The lens is positioned in front of the receiver at a distance equal to its focal length to 'funnel' the beam into the detector.
2. Carefully adjust the position of all components so that the laser beam is reflected from the mirror back to the receiver (via the lens). Pay close observance to all relevant safety measures during this procedure.
3. Link the 1MHz INT socket to channel 1 of the oscilloscope set the vertical sensitivity to 2V per division and the timebase to the highest speed available.
4. Adjust the controls to the centre one of the pulses at a convenient point on the graticule.
5. Link the receiver output sockets to channel 2 and adjust the vertical gain control to give a trace height similar to that on channel 1.

Results: from the selected timebase setting and the horizontal separation of the two traces calculate the time difference. Divide this figure into total path length of the beam to obtain a value for the velocity of light. A figure of the right order should be obtained although great accuracy cannot be expected from such a simple procedure. It is a useful exercise to consider the likely sources of error in this procedure and how they may be eliminated or compensated for.





CROSS REFERENCE

Laser Accessory Set see page 281

Solid State Laser

Designed for safety the laser is now very low-power (1mW) and is protected by a key switch to prevent it's unsupervised use. The power output places the laser in 'Class 2' as recommended for use in schools and colleges. No damage is likely should a stray reflection of the beam enter the eye at such low power.

The wavelength of the light is 635nm which compares favourably with the helium-neon wavelength of 632.8nm.

Additional features include:

- Tapped (M5) exit hole for possible mounting of optical components, fibres etc. Closest to the point of emergence of the beam

- Laser support arm (from the laser accessories kit) connects to a tapped mounting point and allows the laser to be supported using an ordinary clamp stand and boss
- Metal case fitted with 1.8m of mains cable, illuminated ON/OFF switch, locking key switch with 2 keys
- 250mA fuse

Wavelength: 635nm. Beam diameter: 6mm at 5m. Divergence: 3mrad

E8H83651

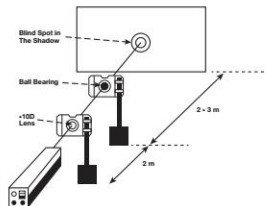
each £419.95

Practical Information

DIFFRACTION BY SINGLE OBJECTS

Unless a very small object is used the laser beam diameter needs to be enlarged. It might be convenient to move the laser back a few metres and use the natural divergence of the beam. It is probably more convenient to insert the -100 diverging lens close to the laser and keep the laser about 2 metres from the object. A medium power microscope objective can produce a greater divergence if this is wanted.

Any lens or transparent material placed in the beam can give rise to diffraction patterns from the dust upon them. These can be distracting and so it is helpful to clean the surfaces carefully, although imperfections are unlikely to be removed completely.



See illustration: A ball bearing gives rise to a circular shadow surrounded by bright and dark rings. A particular feature note is the bright spot in the centre of the shadow. The light wave has bent around the object. Waves from all around the ball arrive at the centre of the "shadow" in phase and so interfere constructively to give the bright spot.

Practical Information

WARNING!

Teachers should be aware of the hazards of laser beams. See D.F.E. Memorandum 7/70 and Scottish Education Department Circular No 766.

THE BEAM SHOULD NEVER BE VIEWED DIRECTLY OR BY REFLECTION.

All teachers using lasers should be properly trained in their use.

A

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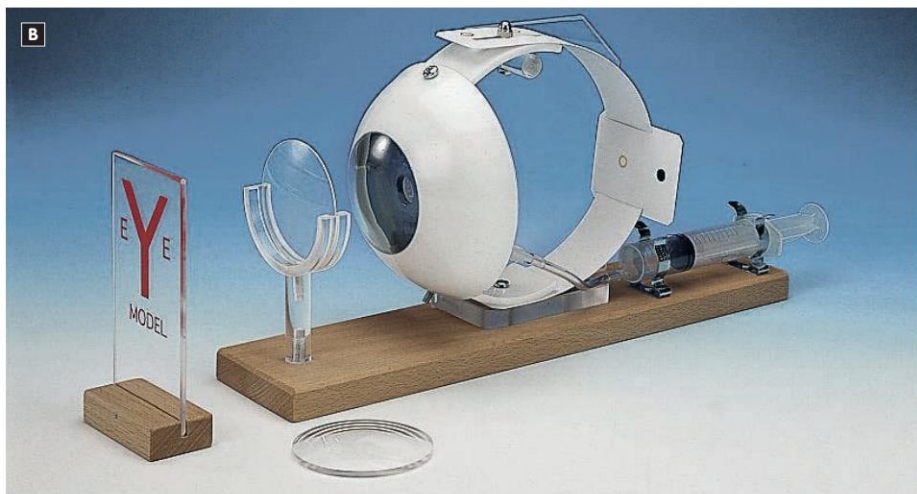
Best
SellerEconomy
Science

CROSS REFERENCE

Fluorescein see page 169



B

Helpful
Hint

FLUORESCENCE

To give the required fluorescence, only a very small quantity of fluorescein should be added to the water in the flask. The model eye can also be used with a laser source, which helps students to compare and understand the classic ray diagrams of the eye, using this large scale model.

A Model Eye Kit

Demonstration kit comprising a 5 litre round bottom glass flask complete with a rubber ring stand, 450g of plastic modelling clay and one each of the following 50mm diameter meniscus lenses +11D, +8D, +5.5D, +2.5D, -3D. The first three lenses are fixed to the flask with plastic modelling clay to show short, normal and long sight respectively when a beam of light is passed through them. The other two lenses are used for correcting the long and short sighted condition. The flask is filled with water with a little fluorescein (sold separately) added in order to show the path of light through the model eye.

Suitable light sources include: Compact Light source, or LED, while. Customers will need to purchase Fluorescein sodium salt separately.

E8A45731

kit £115.95

B Functional Eye Model

This unique model permits demonstration of the physical principles upon which the eye operates, including defects of vision and their correction.

The lens and ciliary body are flexible, the lens itself being fluid filled and connected to a syringe. The syringe can be used to vary the pressure in the lens and hence its thickness, to simulate accommodation. The length of the 'eyeball' may be varied to simulate long or short sight and a lens support mounted in front of the 'cornea' allows external lenses to be used to demonstrate correction via spectacles. A major advantage of this model is that actual images may be projected onto the 'retina', making it an extremely effective demonstration tool.

The complete model is mounted on a wooden base, and has overall dimensions of L320 x H180mm.

E8A45755

each £413.95

A

Direct
Delivery

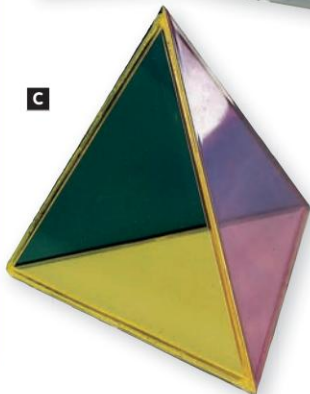


B

Direct
Delivery



C



D



A Colour Paddles

For simple experiments in subtractive colour mixing. A set of six transparent acetate paddles, one each of yellow, red, blue, orange, green and magenta, in the form of a 'fan'. Dimensions L50 x W73mm.

Direct Delivery – up to 10 days

E8A46012

each **£7.19**

B Set of Colour Filters, Mounted

A set of three primary and three secondary acetate filters suitable for use in optical boxes etc, and mounted in plastic frames 50 x 50mm. While not suitable for photographic work, the acetate film is more robust than gelatin for general use. The filters comprise: red, primary; deep blue, primary; dark green, primary; magenta, secondary; yellow, secondary; peacock-blue, secondary.

Direct Delivery – up to 10 days

E8A46127

set 6 **£19.95**

C Colour Pyramid

To show the principles of subtractive colour mixing. A regular tetrahedron with 125mm long transparent plastic sides blue, yellow, magenta and clear respectively. Different colour combinations may be obtained by viewing the pyramid at different angles against the light.

E8A46000

each **£10.95**

D Newton's Disc Card

Spin the coloured disc and the rainbow colours mix to (almost!) white again.

E8A46024

each **£7.19**

Our Own Design

Exclusive

Teachers
GuideGreat
Value

LED.mixer

LED.mixer with Power Supply

- Demonstrate primary and secondary colours
- Investigate colour perception
- Explore true additive colour mixing
- Easy to use alternative to the ray box and filters approach
- Ultra bright LEDs remove the need for full black-out

An eye catching demonstration of the fascinating phenomenon of colour mixing. A simple control box allows users to vary the brightness of six large LEDs (red, green and blue) which are mounted in a robust stand. The kit includes a translucent white Perspex screen and black aperture screen to demonstrate additive colour mixing. Exploring the effect of coloured light on a variety of coloured objects provides entertainment and sound learning. Full instructions supplied on CD.

E8L75267

kit £201.95

This superbright LED.mixer demonstrates the power of primary colours. Create any colour you can imagine and transform ordinary objects, with nothing more than light!

Using superbright LED technology, the LED.mixer makes it easier and cheaper than ever to deceive the eyes of your students, without the need for blackout. Featuring six mounted LEDs (two red, two green and two blue), and an interface giving precise button control over the intensity of each, the LED.mixer can create any colour visible to the eye. The demonstration is enhanced by the included circular aperture, creating circles of overlapping colour, and a translucent screen, so the effect is visible from two sides.



LED.line

- Explore the action of colour filters
- Demonstrate diffraction at different wavelengths
- Calculate the wavelength for each LED colour
- Measure the voltage across each LED and determine Planck's Constant graphically

This visually appealing device clearly illustrates the relationship between colour and wavelength. Seven coloured LEDs plus white, span the visible spectrum. Mounted in a robust vertical column, the LEDs can easily be viewed by a whole class. Depending on the diffraction grating used, first, second and third order fringes can be observed and used for calculations. The LED line has a rotary switch to allow users to select and measure the voltage across each individual LED. Knowing these voltages and the wavelength for each LED, Planck's Constant can be determined. Students have a great opportunity to consider and minimize the sources of error in their experimental work. Teacher's notes are included on CD. 5V Power supply included.

E8J73433

each **£81.95**

Exclusive

Our Own Design

Info

IS IT REALLY YELLOW?

With LED.line alongside the LED mixer, students can use a simple spectroscope to explore the difference between light from the yellow LED, and yellow light produced by mixing red and green light. Use the LED line with a spectrometer to make measurements of the wavelength of light for a range of colours.

Helpful Hint

4mm socket for using an easy reader basic student meter.

A

Our Own Design



B

The spectrometer is an incredibly important and powerful scientific instrument, as it allows analysis of the composition of matter and the structure of atoms, just from the light emitted or absorbed by it. For example, the element helium was discovered using a spectrometer. However, it was not first seen on Earth, but as a bright yellow line in the spectrum of sunlight.

The principle is simple: incident light is bent, or refracted, through an optical device such as a prism or diffraction grating. A spectrum is produced, with each wavelength of light refracted by a unique angle. By measuring the angles at which light is refracted, a precise spectrum can be determined. The spectrum contains a great detail of information about the substance it came from.

By looking at which spectral lines are present, the composition of a light source such as a star can be determined. By looking at what spectral lines are missing, otherwise known as an absorption spectrum, the composition of a body that does not emit its own light, such as a gas cloud, can be determined.

A spectrometer has applications in many areas of science, including astronomy and analytical chemistry. When combined with a spectrum lamp, Philip Harris spectrometers provide an accessible way to teach this essential area of physics.

Economy Science



A Pocket Diffraction Spectroscopy

For examination of the spectral composition of light sources, radiant bodies, etc. The instrument gives a brilliant spectrum with a dispersion of approximately 11° . The slit is of fixed width and is protected by a glass cover plate. The eyepiece is mounted at the end of a draw tube and is adjustable in relation to the slit so that a sharply defined spectrum can be obtained. Both sodium D lines are independently resolved (589nm and 589.6nm) and the Fraunhofer lines are visible. Supplied in a carrying case.

Size: 80 x 19mm, length x diameter.

E8A18102

each £46.95

B Harris Standard Spectrometer Vernier

An economically priced, high-quality, precision manufactured instrument capable of quantitative work. The main structural parts of this laboratory grade spectrometer, including the collimator and telescope bodies are manufactured from heavy castings for durability and precision. This lab-quality spectrometer offers excellent quality at a price that every classroom can afford. The collimator consists of an adjustable slit on one end, with an achromatic converging lens (focal length 178mm) on the other. The lens is secured in a tube which can be adjusted by hand to ensure the slit is in the focal plane

of the lens, thus producing parallel rays. Scale: 170mm diameter, 0 to 360deg x 1deg, capable of independent rotation, with locking screw. A spring-loaded vernier scale (attached to the telescope mount) provides readings to 0.1 deg (6 minutes of arc). Collimator mounted on fixed pillar with axis adjustment. The collimator is mounted on a spring loaded support, integral with the base. The prism table is mounted on a 175mm diameter circular degree scale. The scale is rotatable around the central axis and is provided with a clamping screw. Prism table is provided with three levelling screws and has lines marked to assist with precise placement of prism. The astronomical type telescope consists of an achromatic objective at one end, and a Ramsden's eyepiece with cross wires. The position of the lens can be adjusted by hand. The telescope is mounted on heavy bearings, and can be rotated around the central axis of the apparatus. A clamping screw allows fixing of the telescope position, and a tangent screw allows fine movement. A vernier scale allows the position of the telescope to be read to a precision of 0.1° . Spectrometer is supplied in a durable thermocole box and includes working instructions. Dimensions: 16.5 x 12.2 x 11 inches. Weight: 10.9 pounds. Standard Accessories: 1 prism clamp for prisms up to 40mm high, 1 diffraction grating holder aperture 25 x 25mm, 1 small screwdriver and 1 10mm bar for axis adjustment.

E8R05957

each £397.95

A



B



A Intermediate Spectrometer

- Scale: The 150mm diameter circle with protective plastic shield is fixed to the telescope movement and the table is attached to the double ended vernier which reads 1 minute of the arc. Both telescope and table rotations have fine adjustment screws, and release of a clamping screw enables adjustments of both movements to be made by hand.
- Collimator: Mounted on fixed pillar and fitted with 178mm focus achromatic objective, 25mm clear aperture. Also fitted is a unilaterally adjustable slit 7mm long.
- Telescope: Mounted on moveable pillar and fitted with 178mm focus achromatic objective, 25mm clear aperture. Also fitted is a x8 Ramsden eyepiece and a glass cross line graticule. Both the telescope and the collimator have rack and pinion focusing.
- Prism table: The table is marked with lines to assist placing the prism with respect to the table levelling screws.
- Mass: 11kg

Standard accessories supplied:

- 1 prism clamp
 - 1 diffraction grating holder
 - 1 watchmaker's eyeglass
 - 1 tommy bar for adjusting optical axes
 - 1 plywood case
- Comprehensive setting up instructions also provided. Supplied WITHOUT prism.

E8A46383

each £417.95

B Advanced Spectrometer

- Scale: The 177mm diameter circle is fixed, and the table and telescope movements are completely independent of each other. Both movements can be read to 30 seconds of arc by means of double ended verniers. Both rotations have fine adjustment screws, and release of a clamping screw enables coarse adjustment to be made by hand.
- Collimator: Mounted on fixed pillar and fitted with 178mm focus achromatic objective, 32mm clear aperture. A unilaterally adjustable slit, 6mm long is also fitted.
- Telescope: Mounted on moveable pillar and fitted with 178mm focus achromatic objective, 32mm clear aperture.

Also fitted is a x15 Ramsden eyepiece and a glass crossline graticule. Both the telescope and collimator have rack and pinion focusing.

- Prism Table: The table is marked with lines to assist placing the prism with respect to the table levelling screws, and has interchangeable clamping units for the prism and a diffraction grating.

Standard accessories supplied:

- 1 dense flint glass prism
- 1 prism clamp
- 1 diffraction grating holder
- 1 watchmaker's eyeglass
- 1 tommy bar for adjusting optical axes
- 1 polished hardwood case
- 177mm diameter circle

Allows readings to 30 seconds of arc.

E8A46395

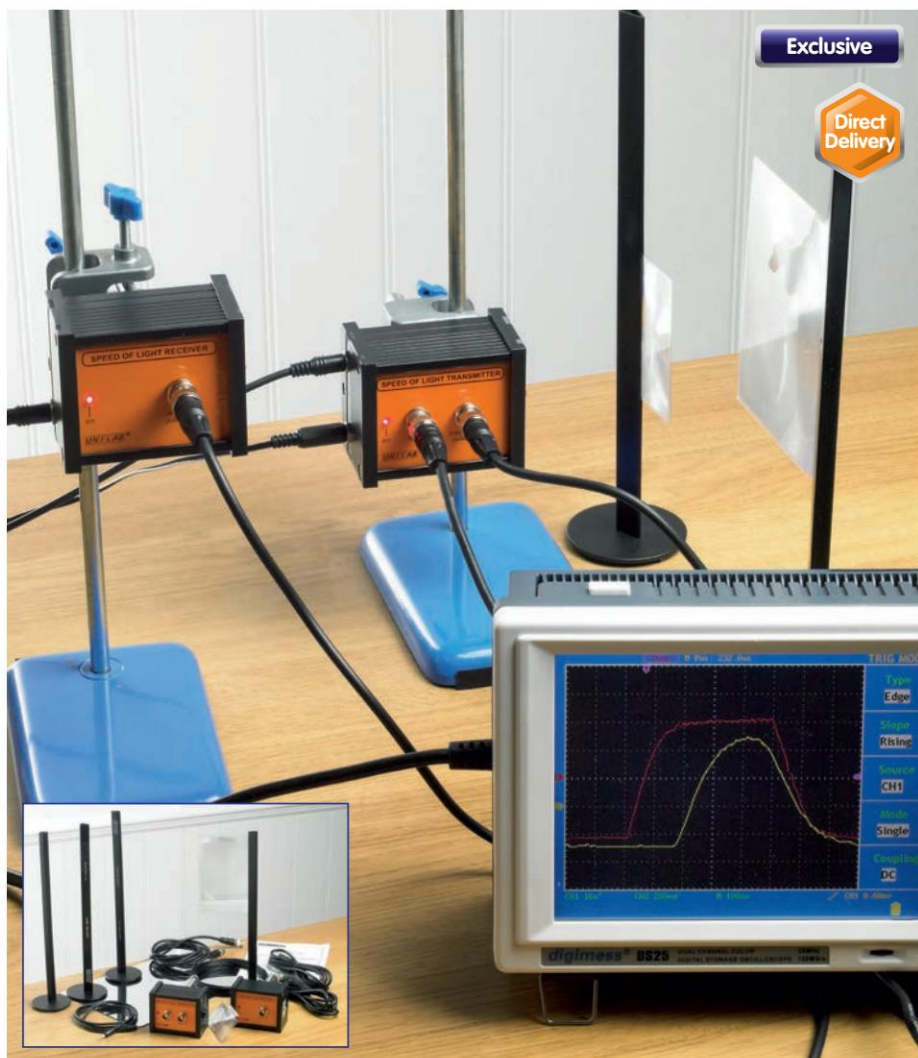
each £1799.95

Spectrometer Prism; Extra Dense Flint

Face dimensions 32 x 32mm.

E8A46413

each £14.95



Speed of Light Kit

- Supplied in a Grateis tray
- Unique kit for the measurement of 'c' directly, within the dimensions of a science laboratory
- Simple to understand method
- Comparison of 'c' in air with that in the plastic of a fibre optic cable for direct calculation of refractive index

The apparatus consists of a transmitter and receiver, two Fresnel lenses with holders, a mirror, plug-top power supply, all connecting leads and instruction booklet.

A double-beam oscilloscope is required (not included), which has an external trigger, a bandwidth of at least 20MHz and time-base with a resolution of 20ns per division.

The transmitter contains a high intensity LED pulsed at 1MHz and provides a synchronisation pulse to the "ext.sync" sockets of the oscilloscope. The light pulse travels are displayed as "Y1" on the oscilloscope. The light pulses travel to the receiver, where its signal is displayed as "Y2". The experiment is performed twice, once with the transmitter and receiver directly aligned 1 metre apart, the second time with the pulses travelling across the laboratory to the mirror and being reflected back.

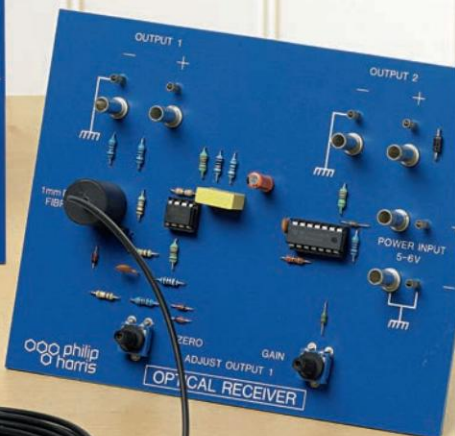
By measuring the difference in the position of the Y2 trace in the two cases the time typically 0.1µs for the return journey across the laboratory typically 30m the speed of light can be calculated.

Direct Delivery – up to 10 days

E8H82993

Kit £407.95

Exclusive



Comprehensive Fibre Optics Kit

This system enables the basic properties of optical fibres to be investigated and the ideas then extended to demonstration of some of the principal scientific and commercial uses. The low-cost plastic fibre may be cut to any desired length with a sharp knife and does not require any special terminating devices. It is also completely non-hazardous. The system comprises a transmitter, a receiver (both built onto P.C. boards 120 x 150mm) and a 25m length of optical fibre. 20m of this is intended for speed of light determination and long distance communication demonstrations.

Transmitter

- Light source: High intensity red LED, output at 630nm
- Modulation: Internal or external. The internal modulation source is a 300kHz oscillator (normally used for the speed of light experiment)
- External modulation input: 0 to 2V d.c. linear, up to 5V digital, or a.c. coupled via external capacitor (not supplied)
- External modulation frequency range: d.c. to greater than 300kHz, TTL compatible
- Monitor output: 0 to 2.5V, for connection to an oscilloscope, or to measure the LED operating current
- Power requirements: 5 to 6V smooth d.c., reverse polarity protected

- Terminations, Optical: simple push-in connection for 1mm diameter optical fibres
- Terminations, Electrical: all connections by both 2mm and 4mm sockets

Receiver

- Input: Solid state photo-detector
- Output 1: d.c. to greater than 5kHz, for connection to meters etc. and general analogue audio signals
- Output 2: High speed digital output, 0 to 5V from below 20Hz to above 300kHz
- Controls: Two, providing for zero-set and gain on output 1
- Power requirements: 5 to 6V smooth d.c. reverse polarity protected, (the transmitter and receiver may share the same power supply if desired)
- Terminations, Optical: simple push-in connection for 1mm diameter optical fibres
- Terminations, Electrical: all connections by both 2mm and 4mm sockets

E8H28627

kit £268.95

Practical Information

COMMUNICATION

The Fibre Optics Kit comes complete with a comprehensive book of experiments.

Topics covered by the range of experiments in the booklet include:

- Exercises designed to create a familiarity with fibre optics
- The transmission of an analogue signal
- Measurement of the 'Speed of Light' in an optical fibre
- Transmission of a digital signal such as a computer programme



A Spectrum Tube Holder

This economical special holder allows an external power source to be used for 26cm long spectrum tubes. Fitted with 4mm safety sockets on black panel. This holder is fitted with bosshead which allows its clamping on any laboratory stand. Stand is not included.

E8R06039

each £51.95

B Spectrum Tubes

Gas-filled discharge tube for studying typical spectra of the different gases and for use in calibrating spectrometers. The glass body is provided with metal end caps and is constricted along the middle portion to concentrate the discharge glow. Maximum recommended running current 3mA.

E8A46539

Hydrogen

each £19.95

E8A46541

Nitrogen

each £19.95

E8A46553

Oxygen

each £19.95

E8A46565

Neon

each £19.95

Laboratory Discharge Lamps

Comprising a lamphouse and transformer and a range of spectral lamps available separately. The lamps give a steady light output of high intensity, and the special design of transformer ensures that the lamps 'strike' immediately they are switched on. When mounted on the integral stand, the lamp is enclosed by a cylindrical metal lamphouse with a circular aperture and the light centre height is adjustable from 200mm upwards.



A

Our Own Design



B



Exclusive

C



D



A Sound Wave Demonstration Set

Apparatus for investigating wave phenomena using sound. The efficient transducers may be driven by the output from a standard audio signal generator, and their sensitivity as receivers is such that they may be used directly on the 5mV input of an oscilloscope.

Detailed equipment notes are provided covering investigations into: reflection and refraction; interference patterns in air; detection and measurement of phase differences in a signal received by two receivers; measurement of wavelength using the phase difference between transmitter and receiver etc.

Units are housed in boxes 100 x 75 x 40mm and the set comprises three transducers and one control box as follows:

- Transducers may be used as either transmitters or receivers. Electrical connection via 2m screened lead with 4mm plugs.

- Control box having 1m of screened input lead with 4mm plugs, & two pairs of 4mm output sockets. Switch permits phase reversal between the two outputs.

EBH30877

set £123.95

B Audio Amplifier and Loudspeaker

300mW amplifier with variable gain and input impedance of 1M Ω with connecting lead (co-axial to 4mm plugs).

Power: internal 9V 150mAh rechargeable battery

Mass: 0.6kg

Size: 150 x 95 x 60mm

EBH29565

each £145.95

C Aluminium Tuning Forks

Precision made, these tuning forks are approximately 120mm long.

EBR06047

Note A 426Hz

each £7.79

EBR06046

Note C 256Hz

each £7.79

D Tuning Forks

Excellent quality aluminium plain shank tuning forks with frequency marked on. Set of 8 containing: A 426Hz, B 480Hz, C 256Hz, C 512Hz, D 288Hz, E 320Hz, F 341Hz and G 384Hz. Supplied in a wooden box for storage.

EBR05153

set £39.95

E Loudspeaker

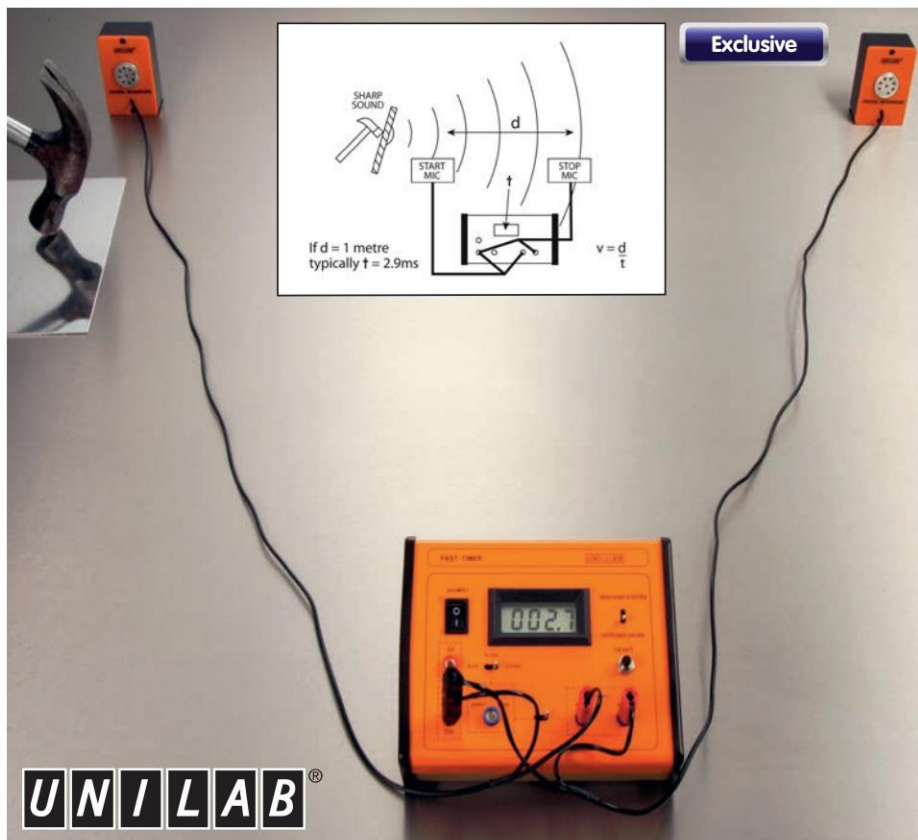
A 75mm diameter, circular loudspeaker of 8 Ω resistance. Contains a high flux ceramic magnet of nominal power rating 5W. Mounted in a rectangular plastic case and with two 4mm sockets for connection. Despite its relatively small size this unit will provide a useful level of sound over the whole audio frequency range.

Dimensions: 150 x 135 x 40mm.

EBH27441

each £28.95



**Speed of Sound Kit**

- Direct method for measuring time taken for sound to travel a known distance
- The Fast Timer can be used in many other experiments

This kit provides a direct method to measure the speed of sound. Timing to microsecond accuracy is started and stopped as sound passes the microphones - see the experimental diagram. A small hammer and metal plate is included in the kit to make the necessary sharp sound. The Fast Timer, when used with mechanical start/stop gates, has many other applications e.g. in the measurement of g by free-fall.

E8R02657

kit £249.95

Spares
and
Accessories**Ceramic Microphone**

E8H27581

each £26.95

**MEASURING THE SPEED OF SOUND**Helpful
Hint

Use the same kit to measure the speed of sound in wood. Turn the microphones face down and press them to the bench, reset the Fast Timer, then tap the bench. Sound travels faster in solids than in air, students will quickly see that the microsecond range is better. If your benches are not wooden, then you are measuring the speed of sound in a different material - as simple as that!

CAPTURE THE ACTION!Practical
Information

The Fast Timer can also be used with a single light gate controlling start/stop or by two separate light gates. A change of level of 50mV is required to start/stop timing.

For a single light gate a positive bias can be selected so the gate can be used whether obstructed or unobstructed. Timing ranges are 1 to 999.9ms and 1 to 9999.9s.



Practical Information

ULTRASONICS APPARATUS

- Investigations into reflection, interference, etc. using Doppler effect
- Possible to transmit speech over 100m distance
- SONAR system may be set up and demonstrated. This equipment operates at a frequency of 40kHz, giving a wavelength in air of approximately 8.3mm under normal atmospheric conditions. Detachable exponential horns increase the range and efficiency of the system. They also constrain the ultrasonic energy into the narrow directional beam required for certain experiments. Investigations into reflection, interference, etc. may be carried out.

By pulse modulating the transmitter output a functional SONAR (sonic RADAR) system may be assembled. However, the longitudinal, unpolarised nature of the ultrasonic vibrations does not allow polarisation experiments to be performed as optical analogues.

Individual units in the range are listed separately. The transmitter and receiver units are supplied with equipment notes.

Great Value

Buy the
Ultrasonics
Kit
and Save!

A Ultrasonics Kit

- Unique kit for convincing demonstration of the wave nature of sound
 - Direct analogue of the properties of electromagnetic waves
 - Units supplied with exponential horns
- Consisting of a transmitter, receiver, slave transducer, two-reflectors and a perforated plate, this kit supports investigations of reflection, interference and diffraction of sound.

E8H76518

kit £325.95

B Ultrasonic Transmitter

Generates the 40kHz signal which is fed to the transducer cell and also to 4mm sockets on the rear panel of the unit. This latter facility enables a second transducer to be driven simultaneously, providing an in-phase double point source for interference experiments, etc. Facilities are also provided for modulating the output of the transmitter using an audio signal generator or audio amplifier/microphone combination. By this method the transmission of speech or other audio information is possible over a distance in excess of 100m. Requires PP9 9V battery (not supplied). Dimensions: case 150 x 95 x 60mm, horn 75 x 100mm mouth diam. x length.

E8H29231

each £151.95



CROSS REFERENCE

AA, LR6 see page 462

C Ultrasonic Receiver

Identical dimensions to the transmitter. The transducer is of the same type as used in the transmitter but in this case used as a detector, its output being applied to a d.c. amplifier circuit. A pair of 4mm sockets allow connection to a 1mA meter for quantitative work. A gain control is also provided so that the output from the receiver provides full scale deflection of the meter under maximum signal conditions. If speech or other audio modulation is used the output from the receiver should be connected to an audio amplifier/loudspeaker combination. Requires 9V PP3 battery (not supplied).

E8H29255

each £151.95

D Ultrasonic Transducer

Similar to the transmitter and receiver, but containing only a transducer cell. Designed to be connected in parallel with the output from the internal oscillator of the main transmitter to produce an identical output allowing experiments in double point-source interference, etc. to be carried out.

E8H29243

each £79.95



Introduce concepts of analogue and digital waves with the Bench Signal Generator, as the nation switches to digital TV and radio. Signals can be viewed on an oscilloscope, and heard using the unit's internal speaker.

Bench Signal Generator

A robust, basic instrument for general laboratory use with all of the advantages of the Spacesaver case. Output signal is adjustable over the full audio range and beyond with a low level of distortion. Coarse frequency control is by way of a rotary-switch spanning four decades and a calibrated tuning dial provides for fine frequency setting. Output level is continuously variable up to a maximum of 2V r.m.s. under open circuit conditions. An audible signal from the built-in speaker can be selected by depressing a front-panel membrane switch. A similar switch enables selection of sinusoidal or square waveform, the status indicated by LEDs.

Dimensions;
Size: W175 x D190 x H298mm,
Mass: 3.1kg.

- 10Hz to 110kHz in four decade ranges selected by rotary switch
- Sine or square waveform selected by push switch with LED indication
- Sine wave distortion 0.5% typical
- Square wave rise time better than 0.25μs
- Output 0-2V rms (5.6V peak to peak) open circuit
- Continuously variable, uncalibrated amplitude control
- Built-in speaker: switch-selected with LED indicator
- Floating output: with separate Earth terminal
- Mains switch: rocker switch with indicator light
- Not suitable for driving a vibration generator

E8G85779

each £197.95



An Audio Signal Generator producing a high frequency, high amplitude sine wave - a loud, high pitched tone

Exclusive



The Student Audio Signal Generator is an excellent way to introduce the concept of sound waves as signals. By connecting to an oscilloscope, students are able to see and hear the wave simultaneously, and learn about three fundamental properties: frequency, amplitude and waveform.

Audio Signal Generator

A compact, single range instrument covering 100Hz to 1.6kHz at 3W output. There is an internal speaker which is muted when the external speaker sockets are selected. CRO connections are provided and there is an amplitude control and waveform select switch (sine or triangular output). Battery powered but with provision for an external supply when used with speakers. Dimensions: 140 x 80 x 35mm.

E8L79157

each £107.95



CROSS REFERENCE

Student Oscilloscope see page 221



The Rubens' tube, also known as a standing wave flame tube, or simply flame tube, is an antique physics apparatus for demonstrating acoustic standing waves in a tube. Invented by German physicist Heinrich Rubens in 1905, it graphically shows the relationship between sound waves and sound pressure, like a primitive oscilloscope. Today it is only used occasionally, as a demonstration in physics education. A length of pipe is perforated along the top and sealed at both ends - one seal is attached to a small speaker or frequency generator, the other to a supply of a flammable gas (propane tank). The pipe is filled with the gas, and the gas leaking from the perforations is lit. If a suitable constant frequency is

used, a standing wave can form within the tube. When the speaker is turned on, the standing wave will create points with oscillating (higher and lower) pressure and points with constant pressure (pressure nodes) along the tube. Where there is oscillating pressure due to the sound waves, less gas will escape from the perforations in the tube, and the flames will be lower at those points. At the pressure nodes, the flames are higher. At the end of the tube gas molecule velocity is zero and oscillating pressure is maximal, thus low flames are observed. It is possible to determine the wavelength from the flame minimum and maximum by simply measuring with a ruler.

Rubens' Tube

Intended for teacher demonstrations only. The Rubens' Tube is an Aluminium tube with a row of small holes drilled along the top and 100W loudspeaker mounted at one end. Full instructions included. Users will need a gas source (Natural or LPG) and a signal generator to run the speaker. Size: 900 x 100mm.

E8R05634

each £407.95



CROSS REFERENCE

Power Signal Generator
see page 302

The Vibration Generator gives mechanical oscillations when fed by signals from a Power Signal Generator. The frequency response encompasses the whole of the audio spectrum and beyond.

Redesigned
and
Improved

A Power Signal Generator

The power signal generator is a versatile device, enclosed in our SpaceSaver case. It can produce a wide range of signals, from 0.1Hz to 110kHz, with an output power of up to 5W. There are low and high impedance outputs, with the low impedance protected by a time delay fuse. The unit features an internal speaker that can be turned on and off, and can be used to demonstrate the range of human hearing (from 20Hz up to 20kHz).

Frequency control is via a 6 position decade dial and a large continuous dial which controls a multiplier from x1 to x11. There are also dials to control amplitude from 0V to 5V, and attenuation on the high impedance output. Buttons control the shape of the function (sine, triangle, square and TTL).

turn the internal speaker on or off, select the modulation mode, and between auxiliary or internal signal.

There are inputs for signal modulation by an external signal, which can be a.m. or f.m., for exploring different types of radio signals, and an auxiliary input for amplification of an external signal instead of the internal function generator, such as from a microphone or music player.

This instrument is ideal for powering large speakers, and is necessary for driving the vibration generator to explore vibrations and waves.

E8G85793

each £347.95

B Vibration Generator

Gives mechanical oscillations when fed by signals from an oscillator/A.F. amplifier. A special high temperature coil system enables the unit to be operated at its maximum rating for a prolonged period without damage due to overheating.

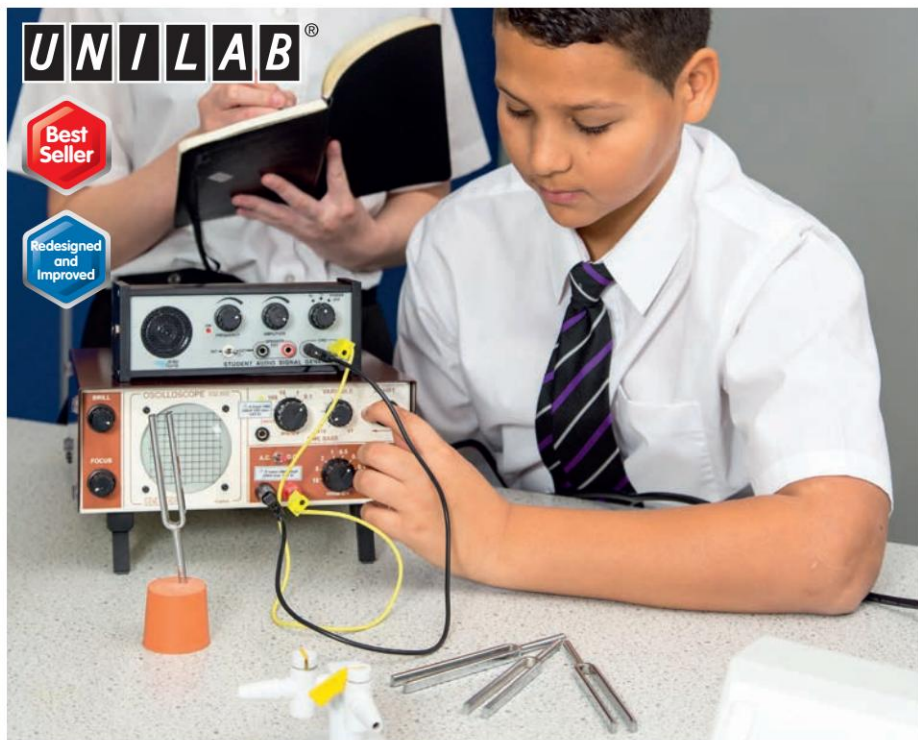
E8H30701

each £73.95

**B****C Vibration Generator Accessory Kit**

The kit contains items for demonstration of standing waves - longitudinal, transverse and two-dimensional. Demonstrate with the coil spring, thick and thin rubber cords, tapered rubber strip, chloridri plate, loop of piano wire and steel strips. The 3D kinetic model has a transparent tube and 20 coloured plastic balls to represent molecules of a gas or liquid.

E8H30920kit **£23.95****C**



Student Oscilloscope

- Inexpensive, single channel oscilloscope with simplified control layout for student operation and permanent triggering feature
- Introductory unit to teach the basics of oscilloscope use with a useful set of features e.g. 8 switched gains from 50mV to 10mV per division and a timebase with switched ranges of 1, 10, 100 or 1000ms across screen with variable x 1 to x 10 control

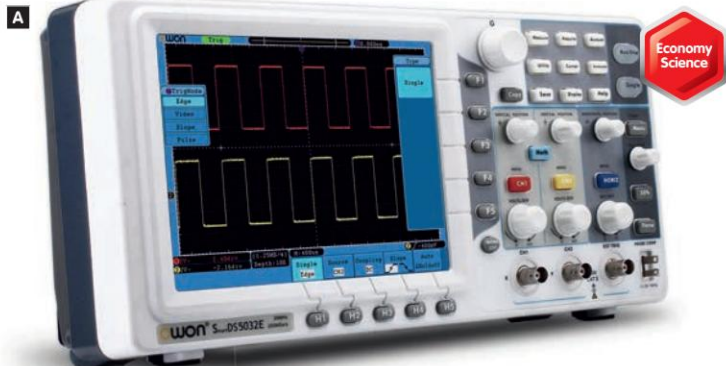
This extremely popular educational oscilloscope is robust and easy-to-use. The flat screen is 70mm across a diagonal with graticule marked in 10 x 10 0.5cm squares. Focus, Brilliance, X shift and Y shift controls determine the position and nature of the trace. A Y input can be passed to the Y amplifier directly or through an internal capacitor to block a d.c. component. Note that with the slowest timebase setting, the spot takes 10s to cross the screen, ideal for slow analogue computing investigations. The start of the spot from the left-hand edge of the screen is synchronised automatically to the positive-going edge of the Y input. (N.B. this may mean that the track takes about 1s to settle down if the Y position is altered). The time base may be switched off and the X input p.d. used to control the horizontal position of the spot, e.g. in Lissajous figures. Student audio signal generator not included.

The steel case is fitted with 1.8m of mains cable, a carrying handle which can be used as a tilt stand, an on/off switch with indicator LED, and cable wraps at the rear.

- Y amplifier: FET input, 1M Ω d.c. to 10kHz
- X amplifier: 1M Ω d.c. to 100 kHz
- Syn. Input: 1M Ω input, triggering at 20mV
- Mass: 3.8kg
- Size 245 x 310 x 105mm

E8R02656

each £457.95



A Owon Oscilloscope

- 30MHz bandwidth
- 250ms/s per channel
- ≤ 5.8 ns rise time
- 8 inch colour TFT LCD display
- Dual channel with external trigger
- Normal sample, peak detect and average sampling mode
- Record length: Max. 10,000 points per channel
- Sampling range: 5S/s–250ms/s for single channel and 15S/s–125ms/s for 2 channels
- Horizontal scale: 4ns/div to 100ns/div in steps by 1-2-5
- Vertical sensitivity 5mV –10V/div
- DC gain accuracy $\pm 3\%$
- Max input voltage 400V (PK – PK)DC+AC PK-PK
- Input Impedance 1M $\Omega \pm 2\%$ in parallel with 20pF $\pm 5\%$
- Input Coupling: AC DC GND
- Trigger Mode: Edge video with holdoff function
- Vertical Resolution: 8 Bits
- Sampling Rate: ≥ 100 ppm
- Interval Accuracy: Single ± 1 interval time + 100 ppm x reading + 0.6ns Average 16: ± 1 interval time + 100ppm x reading + 0.4ns
- Waveform Storage: 15 waveforms
- Automatic Measurement: Peak-to-peak, Average, RMS, Frequency, cycle, Vmax, Vmin, Viop, Vamp, Overshoot, Preshoot, Rise time, Fall Time
- USB interface
- Dimensions 350 x 157 x 80mm

EBR05267

each £317.95

B Oscilloscope

- Features:
- Ultrathin Oscilloscope, small in size and more portable
 - A 7-inch widescreen colour TFT LCD displays clear, crisp and more stable waveform display. 25% more viewing area with the menu switched off
 - Various trigger functions: Edge, Pulse, Video, Slope and Alternation
 - Unique digital filtering and waveform recording functions
 - Pass/Fail function
 - 32 kinds of automatic measurement and manual cursor tracking measurement functions
 - 2 groups of reference waveforms, 16 groups of common waveforms, 20 groups of internal storage/output, support waveform setting
 - External storage and output of CSV and bitmap file by USB flash disc (CSV and bitmaps cannot be output from USB flash disc)
 - Adjustable waveform brightness and screen grid brightness
 - The pop-up menu display mode is more flexible and more natural for users' operations
 - Various kinds of language interface display, Chinese and English
 - On-line help system
 - Shortcut key to PRINT, support print screen
 - Standard configuration interfaces: USB Host, USB Device, RS-232
 - USB Host: support storage of USB flash disc and upgrading of USB flash disc system software

- USB Device: support PC connection for remote communication
- 1Gsa/s sampling rate
- 2 Channels
- 7" Widescreen LCD colour display
- USB Host/Device: Support USB printer and USB flash drive
- PicBridge function
- EasyScope software
- Contains: User manual, product warranty card, 1:1/10:1 probes (2 pieces each), USB cable, CD (containing PC software GAScope1.0)

EBR05916

each £485.95

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



30MHz Dual Trace Oscilloscope

Features:

- DC - 30MHz bandwidth
- 1mV/div sensitivity on both channels
- CH1, CH2 (Independent Channels), CH1 & CH2 (Alternate/CHOP)
- CH2 INVT, ADD and SUBTRACT
- X-Y operation
- 40ns/div to 0.2s/div time base
- 140mm rectangular CRT with internal graticule

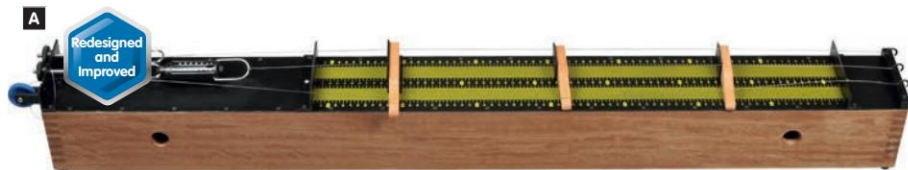
- Triggering to 40MHz
- Z modulation (ITL level)
- 80 x 100mm display
- TV triggering frame (V) and line (H)
- MAINS trigger
- Variable hold off
- Built-in component tester/comparator

E8R05914

each **£545.95**

Oscilloscope Features

CODE	E8R05267	E8R05916	E8R05914	E8R02656
Display Size	8 inch	7 inch	80 x 100mm	70mm diagonal marked in 10 x 10 5mm squares
Bandwidth	30MHz	100MHz	30MHz	30MHz
Time Base	250mS/s per channel	2ns/div to 50s/div	40ms/div to 0.2s/div	0.1ms/div to 100ms/div
Dimensions	350 x 157 x 80mm	399 x 111 x 149mm	165 x 340 x 420mm	245 x 310 x 105mm
Power Requirements	100-240 VAC	240v AC, 50VA max	230V AC $\pm$ 10%, 40VA	230V AC $\pm$ 10, 12VA



A Sonometer, 3-Wire Pattern

Appealing and elegant, the Sonometer is a classical device developed in order to study vibrating strings. With this apparatus it is possible to investigate the dependence of the pitch on the length, tension and thickness of a vibrating string.

Laws and principles investigated:

- Vibration frequency of a stretched string as a function of the length, tension and density of the string
- Frequency versus length
- Frequency versus tension
- Frequency versus mass per unit of length

Students can readily verify the dependence of the pitch on the length of the string, by inserting a bridge under the string at certain lengths. Two strings of different diameter can be put under tension with tuning machines, masses or a dynamometer can be attached to the other string. Strings may be sounded by bowing or plucking.

E8R01219

each £75.95

B Doppler Ball

Did your students ever wonder why a train gets louder as it approaches? Why not show them the physical phenomenon known as the doppler effect with the battery driven device. Load the batteries, swing it in a full circular motion and your students will experience the doppler effect first hand.

E8R05981

each £15.95

C Wire Helix (Slinky)

Ideal for demonstrating different types of waves. Flat-section steel wire in helical coil, diameter 75mm.

Closed height

E8A43485

55mm

each £4.99

E8A43497

110mm

each £6.59

E8A43503

165mm

each £8.59

Spares
and
Accessories

Stainless Steel 304 Wire

15m coil of 0.45mm, 10m coil of 0.56mm, 10m coil of 0.71mm and 5m coil of 0.90mm.

E8R06073

pack 4 £10.95

Sonometer Wires, Brass and Steel

Set of six wires, brass and steel, length 1.5m, in three diameters 0.7, 0.56 and 0.46mm. Ends looped ready for use.

E8H25821

set 6 £7.79

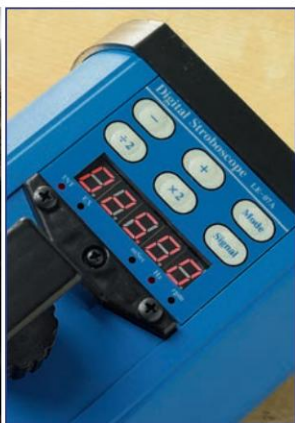
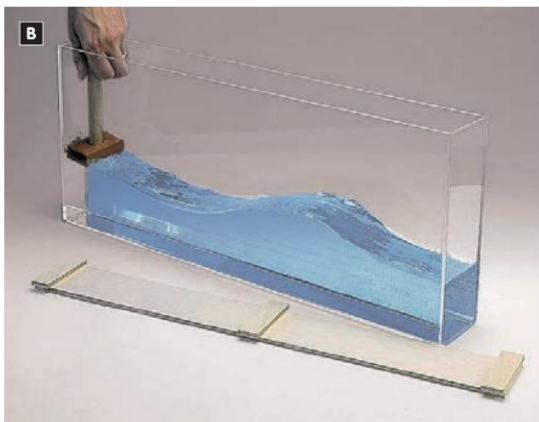
D Steel Spring, Narrow

For transverse wave motion experiments showing standing waves through interference between two waves, reflection of waves and the inversion of the pulse, and the relationships between the initiating pulse, pulse length, wave speed, amplitude and frequency.

The spring is 20mm diameter x 3m long extending to 10m.

E8A43515

each £23.95



A Ripple Tank

Complete with all accessories needed for wave investigations. Intensely illuminated for effective student observations. Built in projection screen. Reinforced frame with foam beaches.

This advanced ripple tank comes complete with all accessories needed for wave investigations. Tank is intensely illuminated by a strong light source, and synchronised with the wave generator to help students observe the wave patterns on a workgroup table. The frame is made of reinforced plastic and with foam beaches (to negate reflections). Includes a mirror, which can be mounted at 45 degrees, to project the ripples onto a translucent screen on one side of the unit. Each water wave acts much like a curved lens. The crest of the wave is seen as a bright region and the trough is seen as a dark region. Inside the ripple tank is a mechanical vibrator attached to a wave generator that produces either point wavelets or parallel wave fronts. Various obstructions and barriers can be inserted into the path of the wave, such as a single slit, a double slit or an edge. Size: $162 \times W39 \times H23$ cm.

- Vibration Generator
- Wave monitor unit
- Projection screen

- Wave dippers
- Lever arm and support
- Ripple tank
- Projection mirror
- Set of footers with adjustment screws
- Set of lucite/perspex objects

E8R05994

each **£175.95**

Ripple Tank Illuminant

Comprising a straight-filament projection type lamp, 12V 21W, S.B.C., mounted in a conical lamphouse and provided with a long supporting rod for attachment to a retort stand. Electrical connection to the lamp is via 4mm plugs. Dimensions of rod: 500×10 mm diameter.

E8H25754

each **£55.95**

B Large Rectangular Tank

For refraction, reflection and wave demonstrations. The tank is transparent, long and narrow to give an adequate path length for wave experiments. A wave generator in the form of a plastic block with handle is provided. Dimensions: $600 \times 75 \times 200$ mm.

E8A43758

each **£119.95**

C Xenon Stroboscope

If something is spinning, oscillating or vibrating very fast, how can you see it? A stroboscope gives the illusion of slowing down, freezing, or even reversing the action. This robust, lightweight stroboscope is ideal for classroom work with vibrations and waves. It features a bright xenon tube that is effective even in low ambient light, meaning complete blackout is not necessary.

Control of flash frequency is by way of intuitive controls, in the range 0.2-300Hz. Coarse adjustment is by multiplier buttons and fine adjustment either by up and down buttons or by analogue-style dial. An external signal can be used instead, such as a signal generator or manual trigger. The unit resets to 1Hz for safety when switched on.

A large LED display shows the frequency setting when using the internal modulator, and will display the frequency of the incoming signal if the external trigger is used. The unit features a carrying handle and is powered via a mains lead. It is an excellent aid when doing experiments with the Vibration Generator and Accessories, or ripple tanks. Watch musical instruments deform as they're played, and measure the speed of objects as they move through space.

E8H30359

each **£275.95**

Exclusive



Great Value

Save

Transmitter and Receiver PLUS Accessories Kit

Save money from your budget by purchasing the microwave transmitter and receiver with the accessories.

E8J73481

kit £539.95

Our redeveloped microwave kit brings exploration of real waves into the lab. With a 3cm wavelength, real electromagnetic wave phenomena can be observed with instruments and measured by hand.

A Microwave Receiver

The receiver comes with a plugtop power supply, and is sensitive to plane polarised waves as emitted by the transmitter. It has an internal demodulator and speaker with volume control, headphone sockets and BNC output to an oscilloscope or meter. It replaces the old Unilab receiver 045.674.

E8J73479

each £311.95

B Microwave Probe Receiver

The battery operated microwave probe receiver is used to measure field strength at points in space, which is useful for standing waves and interference patterns. An internal variable gain amplifier and analogue meter indicates field strength, and a BNC socket allows connection to an oscilloscope or meter for more detailed observation and analysis. It replaces the old Unilab probe receiver 045.673.

E8R01939

each £127.95

C Microwave Transmitter

The transmitter comes with a plugtop power supply, and transmits plane polarised waves. It features a 1kHz internal modulator, and inputs for external signals. It replaces the old Unilab transmitter 044.672.

E8J73478

each £303.95

Exclusive



Kit includes: Microwave Probe Receiver, Microwave Transmitter, Microwave Receiver and Accessories

Microwave Kit with Accessories

Carry out experiments in Reflection, Refraction, Interference, Diffraction, Polarisation and Communication.

The transmitter and receiver have independent plugtop power supplies, making it easy to move and arrange on a bench top to illustrate a variety of E-M properties.

Using only the transmitter and receiver, students can explore polarisation and the effect of distance on signal strength.

As an analogue of the behaviour of visible light, 2.8cm microwaves enable detection and interpretation of nodes and antinodes from simple measurements of the positions of the transmitter and receiver.

The transmitted signal can be modulated using either its own 1 kHz internal modulator, or an external signal source such as a microphone. The receiver has an internal demodulator and internal speaker (with headphone socket) to listen to the signal on the other end. A BNC socket allows you to observe the received signal on an oscilloscope or meter.

The microwave battery operated detector probe allows the student to measure and plot the microwave intensity at points in space, allowing observation of standing waves and interference patterns. It features a built-in amplifier, and a BNC socket allows signal output to an oscilloscope or meter.

From the INCLUDED Accessories Kit, the reflectors can be used to explore single and double slit effects in addition to reflection. Use a single reflector and the probe receiver to demonstrate Lloyd's mirror. The hardboard, semi-silvered mirror can be used to set up the Michelson-Morley experiment prove there is no luminiferous aether!

E8R01946

pack **£659.95**

Microwave Accessories Kit

- 2 aluminium reflectors 210 x 210mm with pairs of feet
- 1 aluminium reflector 210 x 60mm with feet
- 1 hardboard "semi-silvered" reflector 210 x 210mm with feet
- 1 polarisation grille

E8J73480

kit **£29.95**

The microwave kit has been developed by popular demand, with robustness and ease-of-use in mind. Dozens of important and fundamental experiments can be set up in minutes - it could be the most valuable addition to your physics inventory this year.



A 30 Piece Hex Set

A comprehensive 30 piece hex key set covering both metric and imperial keys down to small micro sizes which are not normally included in sets. Clean finished ends. Robust folding case. Contains metric standard length keys, 0.7mm - 10mm. Contains imperial long series keys, 0028in - 3/8in.

E8R06100

set £11.95

B Precision Screwdriver Kit

6 piece set contains 1.4mm, 1.8mm 2.3mm and 3mm slot and no.0 and no.1 crosspoint tip screwdrivers. Hardened blades. Chrome plated polished handles with serrated grip. Hexagonal revolving heads.

E8R06099

kit £4.19

C Crocodile Clips

With strong spring and clamping screw for wire.

E8A58671

pack 10 £1.60

D Crocodile Clips - Plastic Sleeved

An essential resource for any student building circuits, these allow addition of materials for investigation of conductance. Thread wire through and screw clockwise, or push-fit onto the ends of standard plug leads. Colours may vary.

E8A58695

pack 10 £3.19

E Plug Leads, Safety Type with Rigid Sleeve

A heavy-duty 4mm lead providing maximum operator safety by the incorporation of a rigid, non retractable insulating sleeve which completely encloses the plug pin.

- Maximum current rating: 32A
- Maximum working voltage: 1000V ac (tested to 4000V ac)
- Operating temperature range of lead insulation: -10 to +70°C
- Insulation material: PVC
- Nominal length: 1m

E8R05926 Black each £8.39

E8R05927 Red each £8.39

F BNC to 4mm Socket Adaptor

The BNC to 4mm adaptor connects two 4mm plugs to a BNC socket.

E8R05704 each £9.59

G Stackable Plugs

The 4mm pin has a spring insert and the rear of the plug has a 4mm socket. The hexagonal bodies are of resilient moulded plastic and the wire is attached by means of a clamping spring in the bottom of the socket. Maximum current carrying capacity: 10A.

E8A59432 Black each £0.74

E8R01998 Black pack 10 £5.39

E8A59444 Red each £0.74

E8R01999 Red pack 10 £5.39

E8A59456 Yellow each £0.72

E8R02068 Yellow pack 10 £5.39

H 2mm Stackable Plug Leads

Each lead comprises a pair of 2mm stacking plugs with moulded bodies, joined by a length of multi-strand, flexible copper wire. Current carrying capacity 19A maximum. 300mm length.

Colour	Length	each
E8R05922 Black	300mm	£2.59
E8R05923 Red	300mm	£2.59
E8R05924 Yellow	300mm	£2.59
E8R05928 Blue	300mm	£2.59

I 4mm Stackable Plug Leads

Each lead comprises a pair of 4mm stacking plugs with moulded bodies, joined by a length of multi-strand, flexible copper wire. Current carrying capacity 19A maximum.

Colour	Length	each
E8R05705 Black	100mm	£3.09
E8R05706 Red	100mm	£3.09
E8R05707 Yellow	100mm	£2.99
E8R05708 Black	250mm	£3.29
E8R05709 Red	250mm	£3.29
E8R05710 Yellow	250mm	£3.29
E8R05711 Black	500mm	£3.59
E8R05712 Red	500mm	£3.59
E8R05713 Yellow	500mm	£3.59
E8R05714 Black	750mm	£4.19
E8R05715 Red	750mm	£4.19



A Monkey and Hunter Launcher

For full product information please see page 256.

£8R06045

set £83.95

B Van de Graaff Generator, Motor-Driven

For full product information please see page 235.

£8H26758

each £375.95

C Faradays Law

For full product information please see page 203.

£8R05978

each £29.95

D MFA Decisions Module (Mark II)

For full product information please see page 237.

£8H27593

each £95.95

E Newton's Cradle

For full product information please see page 262.

£8R05992

each £16.95

F Hero's Engine (Eolipile)

For full product information please see page 243.

£8L32190

each £43.95

G Dynamics Track and Trolleys

For full product information please see page 261.

£8R03093

kit £237.95

H Eddy Current Kit

For full product information please see page 207.

£8F64953

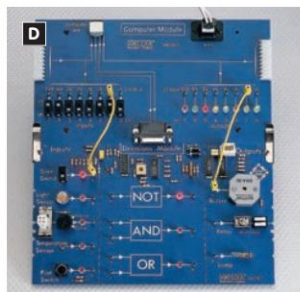
each £12.95

I Basic Electricity Kit (BEK)

For full product information please see page 211.

£8L25835

kit £341.95



Raybox Spares

Collimating Lens for Ray Box

Spares collimating lens for Ray Optics Boxes.

EBG98635 pack 5 £15.95

Colour Filters

Standard colour filters.

EBF05407 pack 6 £100.95

Diffraction Grating

In 50 x 50mm mounts.

EBA46279 300 lines/mm each £15.95

EBA46280 600 lines/mm each £19.95

Festoon Lamp 12v

12v Festoon Lamp suitable for the Economy Science Ray Optics Box B8H77390.

EBA91753 each £1.99

Light Box Only

The bare light box, with formers for a collimating lens and slit plates.

EBA44271 each £79.95

Set of Slit Plates

Spares slit plates for the Light Box and Optical Set.

EBA44222 pair £4.79

Slit Plate for Low Cost Ray Box

Spares slit plates for Economy Science Ray Optics Box B8H77390. 45mm x 75mm. Suitable to be used with both the Ray Optics Box and Battery Operated Ray Optics Box.

EBG98647 pack 5 £3.89

Spares Halogen Bulb

12V, 20W.

EBR02149 each £3.89

Spares Lens

Spares 50mm double convex cylindrical lens for Philip Harris Ray Optics Box B8H77468.

EBR01336 each £10.95

Spares Slit Plates

Spares slit plates for Philip Harris Ray Optics Box B8H77468. 50mm x 100mm.

EBL26955 pack 5 £10.95

Worcester Circuit Board

Circuit Board Only

EBH26953 each £31.95

Connector with Rheostat

EBH26849 each £15.95

Connectors with Lamp Holder

EBH26813 pack 10 £23.95

D, LR20 Battery

EBR05734 1.5V pack 10 £11.95

Plain Spring Connectors

EBH26837 pack 10 £16.95

Push Button Switches

EBH26904 pack 10 £41.95

Rectifier

EBH26850 each £1.44

Resistor

EBH26862 each £2.89

Spares Pegs

Spares Pegs for Worc Circuit Board.

EBH26939 pack 10 £12.95

Wires

Copper Wire, Tinned, PVC Covered

Standard 0.6mm solid core equipment wire, to BS4808. 100m length. Green.

EBA90929 Green each £9.59

Sonometer Wires, Brass and Steel

Set of six wires, brass and steel, length 1.5m, in three diameters 0.7, 0.56 and 0.46mm. Ends looped ready for use.

EBH25821 set 6 £7.79

Stainless Steel 304 Wire

15m coil of 0.45mm, 10m coil of 0.56mm, 10m coil of 0.71mm and 5m coil of 0.90mm.

EBR06073 pack 4 £10.95

Wires for Young's Modulus

Contains 1 each of: 0.90mm bare copper, 0.71mm bare brass, 0.90mm bare brass, 0.56mm stainless steel, 0.71mm stainless steel, 0.90mm stainless steel. All 125g reels.

EBR06101 pack 6 £40.95

Student and Easy Read Meters

Dual 3.5mA d.c. Shunt

EBR05054 each £11.95

Easy-Read Meter

Use the meter to measure the current through the Helmholtz Coils. The attachments are colour-coded and their sockets are arranged to help students grasp the concepts of shunts and multipliers. The basic unit has an input impedance of 100k Ω . The resolution is 0.01 and the accuracy is $\pm 2\%$. Supplied with a PP3 battery that gives a useful life of over 1000 hours, the Easy-Read displays 1.0 BAT when the battery needs to be replaced. Mass: 0.25kg. Size: 95 x 90 x 55mm.

EBR02652 each £59.95

Easy-Read Attachments

The black shunts attach the Easy-Read for current measurement and their sockets are found in the ends of the attachment (current passes through). The orange multipliers attach the Easy-Read for voltage measurements, and have their sockets on the front of the attachment (voltage is measured across a circuit component). The 20V d.c. attachment has an input impedance of 10M Ω .

At least one of the following attachments should be bought for each Easy-Read meter.

EBH30919 20V d.c. Attachment each £17.95

Shunts for Basic Student and Centre-Zero Meters

A set of shunts and multipliers developed to withstand overloads resulting from common student errors. Tough Shunts cover the ranges of voltage and current commonly required in practical work.

- d.c. Ammeter Attachments: these units consist of suitable resistor networks mounted in a grey component channel fitted with three 4mm terminals as a common positive with two ranges

- d.c. Voltmeter Attachments: similar to the d.c. ammeter attachments described above except that the two resistor networks are arranged to have a common negative terminal

- a.c. Voltmeter and Ammeter Attachments: similar to their d.c. equivalents except that appropriate rectifying or transformer circuits are included designed for 50/60Hz circuits

EBH31080 10/50/100mA a.c. each £42.95

EBH31006 1V/ 5V d.c. each £14.95

EBH31043 5V/ 10V d.c. each £21.95

EBH30427 1A/ 5A d.c. each £15.95

EBH31201 50A/ 100mA d.c. each £19.95

EBH30385 2A/ 10A d.c. each £15.95

Spares and Accessories

Accessories for use with Basic Student Meter and Centre Zero Meter.

EBH30683 1/5/10A a.c. each £51.95

EBH30932 1mA/10mA d.c. each £20.95

Motor Construction

Armatures

Moulded, 44 x 30 x 12mm, complete with winding grooves, sockets for index straws and metal bearing tube.

EBH26369 pack 10 £8.39

Shafts

EBH26412 100 x 2mm diameter approx. pack 10 £6.59

White Cotton

EBR01314 90m approx. per reel pack 10 £21.95

Planck's Constant Apparatus

Narrow Band Filters

Recommended for A-level experiments.

EBR05408 pack 3 £47.95

Planck's Constant Apparatus

Planck's Constant Unit

EBH28615 each £479.95

Linear Air Track

Linear Air Track Accessories

Contains two 400g vehicles, one 200g vehicle, three spring buffers, three 'horns' for use with elastic bands, 10 rubber bands, two magnadur magnets and counterweights, a pair of velcro buffers, three black interrupter cards for fitting to the top of the vehicles.

EBL35051 pack £99.95

Boyle's Law Apparatus

Light Red Oil

EBA41750 250ml each £12.95

Bulbs

Low Voltage Bulbs

With straight axial filament, double contact, 5.B.C. Dimensions 55 x 38mm diameter approx.

EBR01296 12V 36W each £1.99

Low Voltage Bulbs - 38mm

With straight axial filament, double contact, 5.B.C. Dimensions 55 x 38mm diameter approx. For Philip Harris Ray Optics Box B8H77468.

EBA56820 12V 24W each £1.56

Transformers

Mild Steel Yoke - 50mm wide

EBH26370 pack 10 £34.95

Miscellaneous

Ball Bearings

High quality steel ball bearings, available in 3 sizes.

EBR05986 3mm pack 50 £4.79

EBR05985 13mm pack 10 £5.09

EBR05984 25mm pack 5 £9.59

Ceramic Microphone

This high impedance, high sensitivity unit may be used with a power amplifier for public address or connected directly to an oscilloscope (page 77) to show audio waveforms. Fitted with 90cm screened flex and two 4mm plugs.

EBH27581 each £26.95

Replacement Key for Spacesaver Units

Replacement key for spacesaver units.

EBR06167 each £3.59



The Logbook Wireless GLE Data Logger can be used with up to 19 Sensors

Logbook Data Logging Range

Our range of data loggers has been carefully selected for their reliability, simplicity and effectiveness. Ideal for students aged 11-16, the Logbook range includes unique features which make it versatile and easy to use. Their USB computer connectivity and bluetooth technology bring the latest technology into your laboratory at an affordable price.

Easy to read

- Metering display on start-up
- Many derived sensors immediately accessible
- Easy to view logs

Easy to connect

- Auto connection to devices through Serial port connection
- Bluetooth enabled
- Able to connect to Dynakar and Garmin Etrex GPS

Easy to log

- Quick start logging available by using meter as channel selection
- Oscilloscope mode - up to 61 us for Logbook GLE
- Normal mode at 100 ms interval

Easy to record advanced logging

- Fully featured control of number of points, duration and interval
- Display compression, full display or refresh/rolling
- Oversampling mode, choice of averaging method: numeric, modal or median
- Sound wave recording from PC microphones

Easy to record event driven logging:

- Triggering on graph
- Snapshot or data variation driven
- Per point tooltip text and X axis labelling

Easy to save records:

- Save recordings as .xls Excel file
- Logbook Graphing .lmz file
- Graph - in text editable area
- Copy data into Excel from data table

Easy to control graphs:

- Repeat log one press to repeat
- Data point and joins control - by time or data
- Slider X and Y axis zoom
- X-Y display of data in any graph, including time for event driven graphs
- Fourier transform analysis on any data
- Data modelling parallel with graph data
- Duplication or deletion of tracks in graphs
- Access to web charting
- IOST charting

GPS enabled

- View data from sensors as graph with velocity calculated from GPS data
- Create Google Earth 3D Visualisation of Data
- Create Google Map Visualisation
- Incorporated photos into visualisations - time based

Innovation



Practical Information

- Easy to connect, auto connection through serial ports and Bluetooth enabled
- Easy to log, quick start logging available
- Easy to save, save files as .xls, .lmz or as an editable graph
- Easy to control, one-press repeat log, slider X and Y axis control
- GPS enabled, create Google Map or Google Earth 3D visualisations

Logbook Wireless GLE (Including Software)

The Logbook GL with its graphics screen and built in temperature, light and sound sensors offers the most comprehensively featured Logbook to date.

Key features include:

- Graphics screen enables graphical visualisation of data during a recording and from saved files
- Direct USB connection to the computer
- Built in temperature, light and sound sensors - each sensor can be turned on and off individually
- Four channel input
- Auto sized meter and graph screens giving a large font meter for one and two channel use
- Simple five button operation
- Unique roll mode recording making many lab recordings even more simple
- Snapshot and Auto recording modes for remote recordings

- Extended memory option allowing remote recordings of up to 44,000 data points
- Bluetooth wireless connectivity

E8R05745

E8R05929

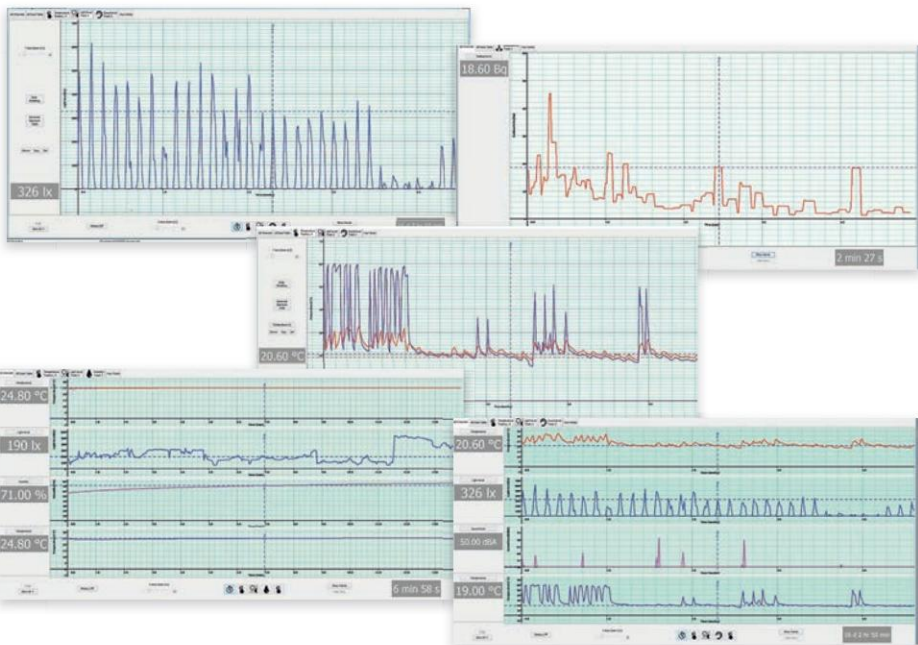
each **£371.95**

pack 5 **£1739.95**

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exportsales@philipharris.co.uk





Logbook Graphing Secondary Software

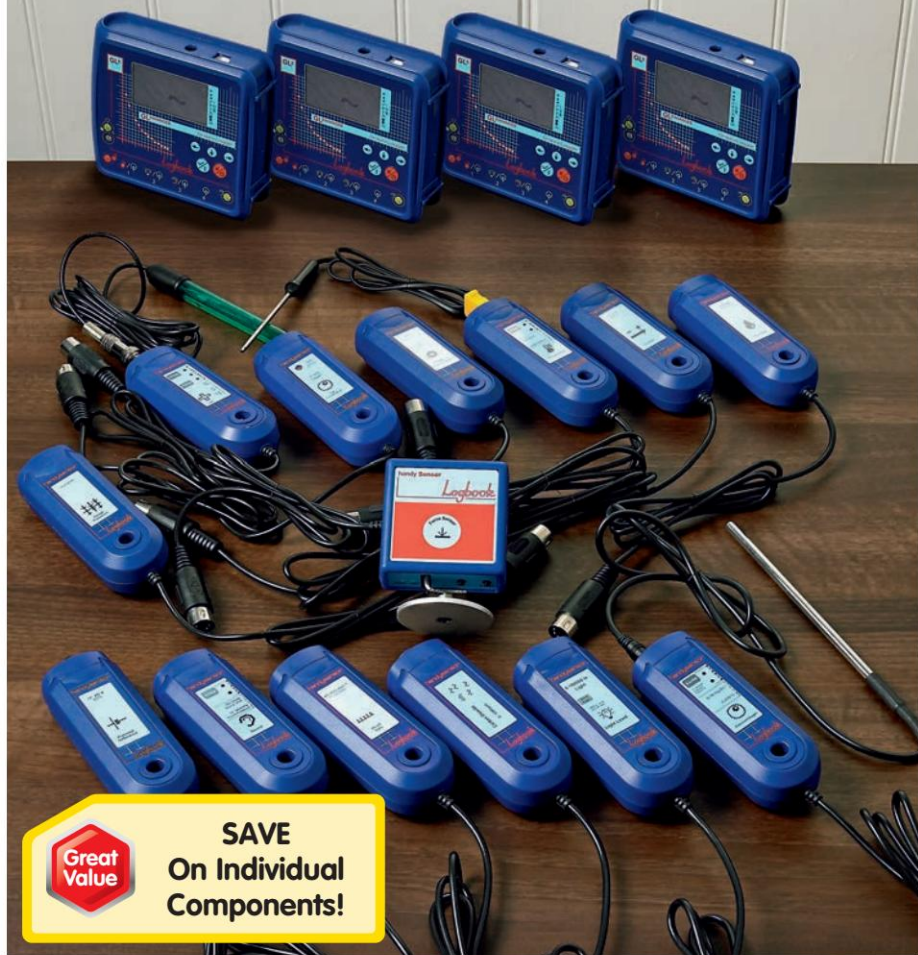
Through simple use of the drop down menus and toolbars students are able to carry out a range of investigations. Logbook Graphing offers a new concept in sensor technology by offering the ability to both meter and record from a number of combination sensors. Logbook Graphing functionality ranges from a simple triggered recording through to the comprehensive area under graph plotting and calculation via a cursor. Also incorporated

in Logbook Graphing is Datamass, which allows integration (using a USB or an RS232 connection) with a range of compatible balances. Auto plug and play is available with a Logbook USB cable and Ohaus balances.

E8R05783

each £191.95

Innovation



SAVE
On Individual
Components!

Logbook Starter Bundle

Includes:
4x Logbook GLE Wireless Data Loggers
1x Dual Range Force Sensor
1x Oxygen Atmospheric Sensor
1x CO₂ Sensor
1x Pulse Sensor
1x Accelerometer Sensor
1x 10Amp Current Sensor
1x Humidity Sensor
1x Advanced Light Sensor
1x Advanced pH Sensor

1x Pressure Gauge Sensor
1x Sound Sensor
1x Temperature Sensor
1x High Temperature Sensor
1x 20V Voltage Sensor

EBR05784

pack £2399.95

The perfect kit to get you started with our range of data loggers. This comprehensive set provides lots of opportunities to explore data logging in all areas of science. Plus the included DataDisc Explorer Software allows for both metering and recording from a number of combination sensors.



Innovation

Respiration of peas using the Oxygen Atmospheric sensor

Great Value

SAVE
On Individual Components!



This is a great value bundle that can be used for a range of investigations in Biology, including respiration, photosynthesis and energy in food. A logbook is also included, complete with all relevant software.

Biology Bundle

This Biology Bundle includes:

- 1x Logbook G.E. Wireless Data Logger
- 1x Oxygen Atmospheric Sensor
- 1x Pulse Sensor
- 1x Humidity Sensor
- 1x Advanced Light Sensor
- 2x Temperature Sensors
- 1x CO₂ Sensor
- 1x Skin Temperature Sensor

EBR05782

pack £899.95

Innovation



An excellent range of sensors for Chemistry lessons within the classroom. These sensors can be used for a wide range of practical applications, including investigations into endothermic and exothermic reactions and household acids. The logbook is also included with all relevant software.

Chemistry Bundle

This great value Chemistry Bundle includes:

- 1x Logbook GLE Wireless Data Logger
- 1x High Temperature Sensors
- 2x Advanced pH Sensors
- 1x Advanced Light Sensor
- 1x Volume Gas Sensor

EBR05781

pack **£779.95**





Innovation

To record road side pollution analysis



SAVE
On Individual Components!



This bundle includes a great mix of sensors that can be used both inside and outside the classroom. The logbook can be operated cordlessly, making it ideal for completing field work studies. Two Logbooks are also included, along with the relevant software.

Fieldwork Bundle

A comprehensive Fieldwork Bundle that includes:

- 2x Logbook GLE Wireless Data Loggers
- 1x IR Distance Sensor
- 1x Advanced Flow Sensor
- 1x Advanced Light Sensor
- 1x Nitric Oxide Sensor
- 1x Dissolved Oxygen Sensor
- 1x Sound Sensor
- 1x Sulphur Dioxide Sensor
- 1x UV Irradiance Sensor
- 1x Nitrogen Dioxide Sensor

E8R05786

pack **£2039.95**

Innovation

Great Value

SAVE
On Individual
Components!



To record the variations in thermal radiation using a Leslie cube

This bundle can be used for both intermediate and advanced Physics applications, including investigations into static and kinetic friction, the speed of sound and electrical energy. It provides a wide range of sensors which can be used to log, analyse and present information, as well as a Logbook and software.

Physics Bundle

The versatile Physics Bundle offers great value for money and includes:

- 1x Logbook GLE Wireless Data Logger
- 1x Dual Range Force Sensor
- 1x Accelerometer Sensor
- 1x 10Amp Current Sensor
- 2x Lightgate Sensors
- 1x Pressure Sensor
- 1x Sound Sensor
- 1x Temperature Sensor
- 1x 20V Voltage Sensor

EBR05785

pack £917.95





This range of Logbook sensors offer a comprehensive selection suitable for all areas of science. From great value Starter Bundles for Biology, Chemistry and Physics, to the radioactive sensor, this range ensures every area of the experiment can be logged. The table below details each sensor's min and max operating values, as well as its resolution.

Sensors	OPERATING VALUES		
	Min	Max	Precision
Accelerometer (range1) ms ⁻²	0	250	0.5
Accelerometer (range2) ms ⁻²	0	60	0.1
Accelerometer (range3) ms ⁻²	0	15	0.02
CO ₂ (ppm)	300	100000	5% of reading
Current 10Amp (Amps)	±10		0.02
Dissolved Oxygen (range 1) (%)	0	240	1
Dissolved Oxygen (range 2) (mg dm ⁻³)	0	20	0.1
Flow Advanced (ms ⁻¹)	0	5	0.05
Force Sensor Dual Range (range1)(N)	±8		0.01
Force Sensor Dual Range (range2)(N)	±50		0.2
High Temperature (range 1) (degrees °C)	-200	1200	2
High Temperature (range 2)	-20	120	0.2
Humidity (%)	0	100	1
IR Distance (mm)	200	1200	1
Light Advanced (lux)	0	100000	2% of reading
Nitric Oxide (ppm)	0	10	0.01
Nitrogen Dioxide (ppm)	0	10	0.01
Oxygen Atmospheric (%)	0%	30%	0.10%
pH Advanced (pH)	0	14	0.2
Pressure 0-700 (Kpa)	0	700	1
Pressure Gauge (Kpa)	-110	700	1
Pulse (bpm)	0	240	1
Radioactive Count Rate (s ⁻¹)	0.1	1000	2% of reading
Sound (dB)	30	110	1
Sound (mPa)	±90		
Sulphur Dioxide (ppm)	0	10	0.01
Temp Skin	-20	120	0.2
Temperature (degrees °C)	-20	120	0.2
Temperature Infrared (degrees °C)	-17	550	±2
UV Irradiance (Wm ⁻²)	0	100	1% of reading
Voltage 20V (Volts)	±20		0.05
Volume Gas (CC)	0	55	0.1

**A Pulse Sensor**

This sensor can be used either with a standard chest belt to measure heart rate during exercise or with an ear/finger clip for before/after exercise. Wireless communication from the belt strap ensures reliable measurements. The pulse sensor measures pulse rate from 0 to 240 beat per minute.

E8R05792

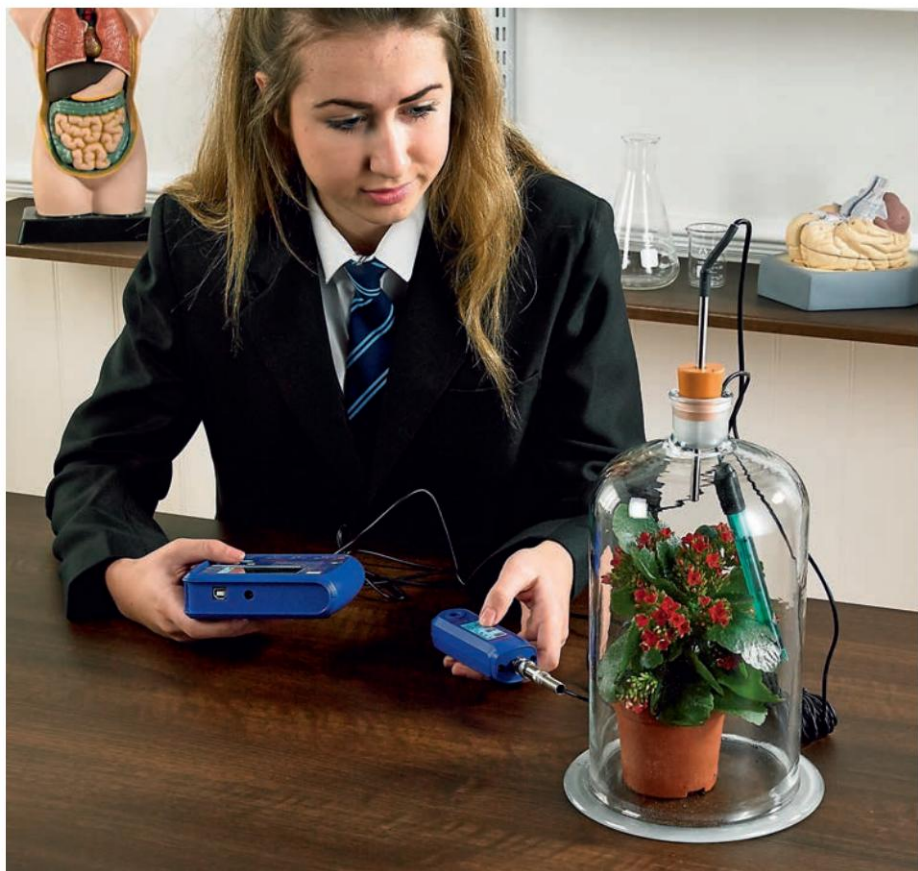
each £89.95

B Spirometer Sensor

Consists of a low pressure sensor, ± 1 kPa, and a Spirometer mouthpiece. It can be used either to measure breathing rate, or to assess the function of a subjects lungs. The Spirometer mouthpiece is part of the accessory pack for the 1kPa Pressure sensor, both of which are supplied. Range: ± 1 kPa, res 0.002kPa. Minimum recommended recording interval is 10ms.

E8R05918

each £179.95



A



A pH Probe Sensor

Measures pH levels from pH0 to pH14. Allows the user to calibrate to pH7 remotely, and to perform 1 or 2 point calibration to any pH when using Datadisc. Range: 0 to 14pH, res 0.01 pH units. Minimum recommended recording interval is 1 second.

Also use this sensor to measure:

- Temperature compensated pH levels
- Ion concentration

Applications include:

- Investigate the chemistry of buffers
- Photosynthesis

E8R05795

B



B CO₂ Sensor

Measures atmospheric CO₂ levels at a sensitivity which is rapid enough to monitor variations over a few minutes. The cell has a life of approximately 2 years; replacements are available. Range: 0 to 100,000 ppm, res 1.5% of reading. Minimum recommended recording interval 1 sec.

E8R05791

each **£143.95**

each **£99.95**



A Volume Gas Sensor

This unique sensor makes investigating of gas laws and titrations much more simple. There are two interchangeable syringes to make this sensor both a 60cc volume sensor and a volume gas syringe.

Specification:

Volume 60cc

- 0 to 60cc, res 0.1cc

Volume Gas Syringe:

- 0 to 55cc, res 0.1cc

F8R05797

B Oxygen Atmospheric Sensor

This sensor is designed to measure the oxygen content of air and investigating respiration.
Range: 0 to 30%, res 0.1%.

Minimum recommended recording interval is 100ms.

Also use this sensor to measure:

- Velocity

Applications include:

- Transpiration of plants

- Oxygen content of breath

each **£185.95**each **£215.95**



A



A 3 Axis Accelerometer Sensor

This sensor calculates the magnitude of the acceleration vector or the directional acceleration for the selected axis depending on the mode selected.

Ranges:

- 0 to 250ms⁻² res 0.5ms⁻²
- 0 to 60ms⁻² res 0.1ms⁻²
- 0 to 15ms⁻² res 0.02ms⁻²
- X axis $\pm 11.5\text{ms}^{-2}$ res 0.05ms⁻²
- Y axis $\pm 11.5\text{ms}^{-2}$ res 0.05ms⁻²
- Z axis $\pm 11.5\text{ms}^{-2}$ res 0.05ms⁻²

Minimum recommended recording interval
Also use this sensor to measure:

- Velocity
 - Distance
- Applications include:
- Study of Newton's Laws using dynamics cart
 - Motion acceleration in a vehicle
 - Acceleration experienced by a person on a roller coaster

E8R05747

each £155.95

B



B Dual Range Force Sensor

The dual force sensor has 2 ranges. The low range is ideal for measuring the impacts of model cars on the sensor plate and the impulse generated by a small object such as a ping pong ball bouncing. The high range is suited to measurement of large impulses and forces associated with heavier objects.

Ranges:

- Low range sensor $\pm 8\text{ N}$, res 0.01 N
- High range sensor $\pm 50\text{ N}$, res 0.2 N Minimum recommended recording interval is 1 ms

E8R05790

each £125.95

Innovation



A

**A Temperature Sensor**

This probe is designed for general use such as the temperature measurement of air, surface or liquids.

- Range -20 to 120°C, res 0.2°C
- Safe for use in all readily available classroom chemicals
- Minimum recommended recording interval is 10 ms for the temperature probe

E8R05787

each £35.95

B

**B Infrared Temp Sensor**

Ideal for measuring the temperature of remote objects. It works by pointing the unit at the object being measured, pressing the button and reading the temperature using one of the Logbook range of data loggers. Most suitable for taking snapshot recordings of temperature. Remote infrared based temperature measurement from -17°C to 550 °C.

E8R05805

each £89.95



Light Gate Sensor Kit

Using any air track the kit can be used to show conservation of momentum and energy in elastic collisions and conservation of momentum and change of energy in elastic collisions. Includes Datalogic Timing and two lightgates.

E8R05801

kit £149.95

Innovation



CROSS REFERENCE

Expendable Steel Springs see page 269

Distance IR Sensor

Ideal for carrying out investigations of motion and displacement. It uses reflective technology and ideally the target should be white. It is most accurate in the range 200 to 1000mm. A number of these sensors can be used in the same room as they do not interfere with each other, provided they are at least 2m apart.

Also use this sensor to measure Velocity.

E8R05803

each £125.95

Practical Information

Applications include:

- Distance / time graphs
- Harmonic motion
- Oscillating mass on a spring



Applications include:

- Half life
- Randomness of radioactive particles
- Absorption of radiation

Radioactive Sensor

This sensor has a variable sample rate depending on the radiation level. At low radiation levels the sample period goes up to 8 seconds. At higher radiation levels the sample period will automatically decrease giving a faster response.

Range: 0.1 to 1000 counts s⁻¹, res 2% of reading.

Minimum recommended recording interval is 100 ms.

E8R05802

each **£275.95**

**A****A Humidity Sensor**

The sensor uses the latest semiconductor sensor technology to provide accurate and reliable temperature compensated humidity measurements in all school laboratory applications.

Specification:

- 0 to 100% (non-condensing)
- res 1% Built-in temperature compensation
- Minimum recommended recording interval is 1 second

E8R05794

each **£71.95**

B**B Advanced Light Sensor**

The advanced light sensor can measure from 0.5 to 100,000 lux, with relative accuracy at all levels. It is ideal for experiments needing accurate quantitative results at all incident light levels. This sensor can select either fast or slow response modes.

E8R05788

each **£71.95**



A Pressure (Gauge -110 - 700 KPa) Sensor

Ideal for the investigation of gas laws. It measures absolute pressure so that in a normal room environment it will measure the atmospheric pressure which is approximately 100kPa. It can therefore measure both a vacuum and higher pressures. When used with the Volume sensor it is easy to investigate the relationship between pressure and volume. Range: -110 to 700 KPa, res 1kPa. Minimum recommended recording interval is 10 ms.

EBR05796

each £137.95

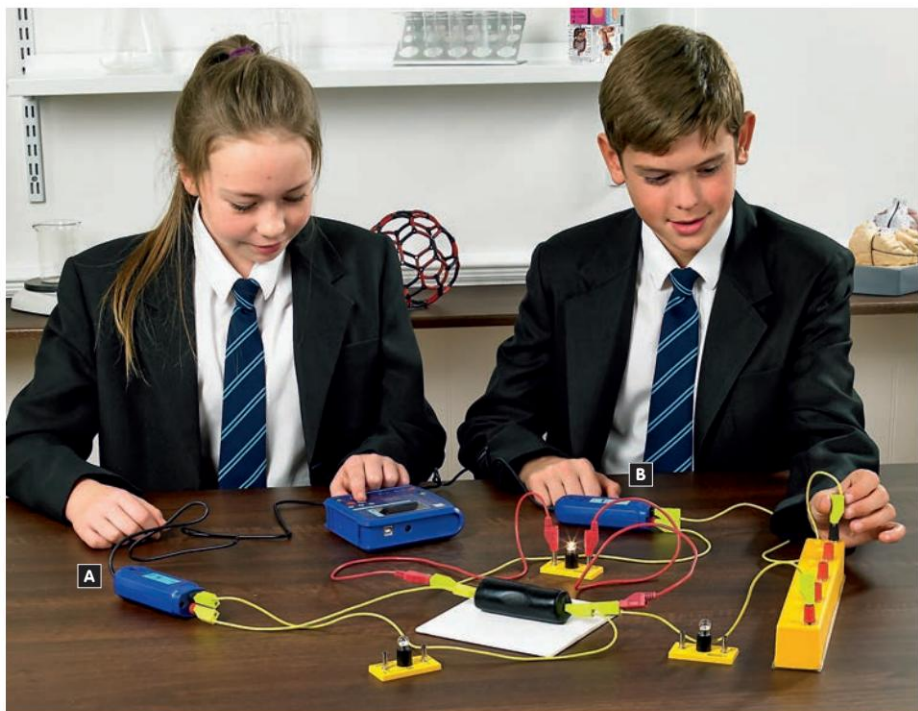


B Sound Sensor

Suitable for investigating the sound level in normal working environments, and very low levels such as the dawn chorus. It has ranges for sound waves either in dB or in KPa. The sensor has a fast response: two sensors placed a few metres apart can be used to measure the speed of sound.

EBR05789

each £69.95



A Voltage Sensor (20V)

The sensor is designed to measure variations in voltage, both positive and negative, work from DC up to 10kHz and can be used with Current sensors anywhere in a circuit with a supply voltage range of less than 24 volts. Range ± 20 V, res 0.05 V.

Also use this sensor to measure:

- Power
- Energy
- RMS Voltage
- Current (if circuit resistance is known)
- Resistance (requires a current sensor)

E8R05748

each **£53.95**

B Current ± 10 A Sensor

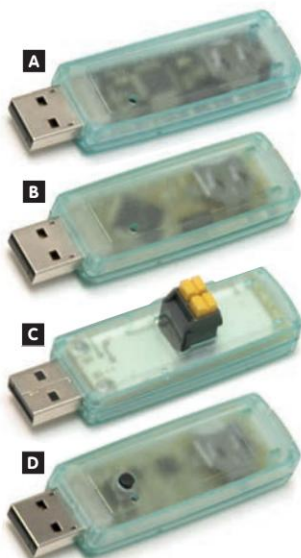
Designed to measure variations in current, both positive and negative. They work from DC up to 10 KHz and can be used together with other Logbook current and voltage sensors anywhere in a circuit with a supply voltage range of less than 24 volts.

Also use this sensor to measure:

- Charge
- Power
- Energy
- Voltage (if circuit resistance is known)
- RMS Current
- Resistance

E8R05793

each **£53.95**



CURRICULUM LINKS

Working scientifically

- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

These mini data loggers, designed by Mindsets, are an indispensable tool for all manner of investigations and experiments. All the loggers come in the form of a USB stick, so no cables are required to retrieve data or configure the device. The sensor, memory and battery are all encapsulated on a single circuit so no additional hardware is required (battery life is estimated at 2 to 3 years and is replaceable). Sample rates can be set between once per second and once every hour, meaning the sample memory can store from 2 hours to almost a year of data! May be used indoors or outside, or even in a liquid if protected in a self-seal bag or container.

Each mini data logger comes with FREE software.

The process is as follows:

1. Insert the data logger into the computer and launch the software to configure the data logger - i.e. set the frequency of the readings.
2. Remove the data logger from the computer and place it where readings are required. Readings are recorded automatically at the frequency set during configuration.
3. Insert the data logger into the computer to download the data when required.

A Mini Temperature Data Logger

- Record up to 8,192 samples
- Recommended temperature range -20 degrees C to +60 degrees C
- Resolution of 0.1 degrees C
- Can optionally set a start date and time
- Inbuilt power supply - no cables required
- Simple to program

EBR05750

each **£20.95**

B Mini Light Data Logger

- Record up to 16,384 samples
- Measure illuminance from 5 lux to 70 klux (logarithmic response)
- Can optionally set a start date and time
- Inbuilt power supply - no cables required
- Simple to program

EBR05798

each **£20.95**

C Mini Voltage Data Logger

- Record up to 8,192 samples
- Measure 0 to 10V with a resolution of 20mV
- External voltage source is connected via a screw-less terminal block
- Can optionally set a start date and time
- Inbuilt power supply - no cables required
- Simple to program

EBR05799

each **£29.95**

D Mini Acceleration Data Logger

- Record acceleration in three axis simultaneously (up to 6,144 samples per axis)
- Selectable sample rate of 50 or 200 samples per second
- Measure acceleration up to $\pm 8g$ ($\pm 78.45m/s^2$) at a resolution of 62.5mg (0.6129m/s²)
- Inbuilt power supply - no cables required
- Simple to program

EBR05800

each **£29.95**

A Radioactive Count Rate SensorMeter

- Variation of rate with distance
- Absorption of radiation

The Radioactive Count Rate SensorMeter measures radioactive count rates from 2 to 1000 counts per second in three ranges. The SensorMeter has a quiet click sounder giving an indication of count rate which may be switched off if not required. The combined Geiger tube and connecting lead (supplied separately), enables the detection of alpha, beta and gamma radiation and is easily hand held or clamped at a set distance from the source. The Radioactive Count Rate SensorMeter has a BNC socket for connection of the System SM Geiger probe, supplied separately.

- Linearity: $\pm 0.5\%$ 20 to 1000 counts s⁻¹ assuming best range is used
- Time constant: 3.3s or 0.33s switchable
- Readability: 0.4%
- Battery life: 40 hours constant use typical with PP3 Manganese Alkaline battery (Battery NOT included)

EBH28640

each £269.95

B Ultraviolet SensorMeter

- Effectiveness of barrier creams and suncreams

The Ultraviolet SensorMeter is especially logical enabling students to monitor UV irradiance throughout the day or investigate the effects of barriers such as creams and sunglasses to UV radiation. Three selectable ranges are provided which cover those levels of UV irradiance likely to be found. The separate hand held probe supplied with the SensorMeter enables directional readings of UVA and UVB to be taken.

- Ranges: 0 to 100Wm⁻², 0 to 10Wm⁻², 0 to 1Wm⁻²
- Readability: 0.01Wm⁻²

EBH29036

each £335.95

C pH/mV/°C SensorMeter

- Acid-base titrations
- Fermentation in yogurt

The pH SensorMeter assumes 20°C for temperature compensation when measuring pH, which is adequate for school use.

A pH probe with BNC connector is required (NOT included)

- Readability: 0.1 pH
- Battery life: 40 hours typical with PP3 (NOT included)

EBH27609

each £263.95

D Light SensorMeter

- Inverse Square Law
- Rate of enzyme reaction (e.g. Starch and amylase)
- Photosynthesis in Chlorella
- Temperature and sugar concentration effects on yeast growth

The Light SensorMeter measures light intensity over a very wide range (from 0.1 to 100,000 lux) in five separate ranges in addition to a log range. The speed of response of the SensorMeter can be altered on the linear ranges enabling changes in light intensity which occur at intervals of less than 50µs to be detected. This can be used to record the 100Hz flicker of fluorescent lights. Conversely the slow setting can be used to cut out the interference from fluorescent light flickering. Supplied complete with a probe with an adjustable hood which can be used to vary the acceptance angle of the probe over a wide range. This is useful in studies where the direction of illumination is important.

- Spectral response: 400 - 700nm with optional IR filter, 400 - 1000 without filter
- Response time: Fast approx 50µs, Slow approx 50ms
- Readability: 0.01 lux on 10 lux range
- Battery life: 80 hours typical with PP3 Manganese Alkaline Battery (NOT included)
- Accuracy: 15%
- Resolution: 0.2% (computer), 0.2% (display)

EBH27659

each £239.95



Practical Information

Our fantastic range of data loggers has replaced the Acquire range. However, we are still able to supply spares and offer technical support. Please feel free to contact our team at: techsupport@philpharris.co.uk with any questions or needs you may have.

Spares and Accessories

SensorMeter Geiger Probe

EBH28869

each £191.95

SensorMeter to Logbook Sensor Range Cable

EBR05806

each £10.95



A Getting Ready Kit

E8R06285

pack **£89.95**

B Designing Clothes

E8R06287

pack **£94.95**

C Going Bowling

E8R06286

pack **£93.95**

**A Nozzle Set 2.0**

A changeable nozzle set, store your nozzles and supercharge your creative powers!

EBR06275

set **£23.95**

B Pedal

Give your fingers a break. Use the 3Doodler Pedal for those longer 3Doodled projects.

EBR06276

each **£23.95**

C 3Doodler 2.0 Pen

The World's first and best 3D Printing Pen. If you can scribble, trace or wave a finger in the air you can use the 3Doodler 2.0. The 3Doodler 2.0 allows you to literally draw in the air by extruding heated filament that cools almost instantly into a solid, stable structure. Whether freestyle 3D sketching or tracing shapes from templates to make larger architectural structures, the 3Doodler 2.0 allows artists, designers, hobbyists, teachers, and architects to test out their ideas quickly and easily. Supplied complete with power supply, tools and two packs of filament.

EBR06273

each **£118.95**

D JetPack

A portable power pack that gives you the freedom to 3Doodle on the go. 3D pen not included.

EBR06277

each **£47.95**

E DoodleStand 2.0

The perfect place to store your 3Doodler and 3Doodler stands between creative sessions. 3D pen and filaments not included.

EBR06274

each **£11.95**

F 3Doodler EDU Bundle

The EDU bundle contains: 12 x 3Doodler 2.0 pens, 12 x Power adapters, 12 x DoodleStands, 4 x nozzle sets, 2 x jet packs, 1,200 strands of plastic (500 ABS, 500 PLA, 200 FLEXY), 12 x mini screwdrivers, 6 x nozzle removal tools and 6 x unblocking tools.

EBR06278

pack **£1199.95**

G Glow in the Dark PLA Strands

A stickier plastic great for 3Doodling on windows, metal and other hard surfaces. Made of corn and 100% compostable. For best performance set your 3Doodler to low temperature. Contains: 25 x 10 inch glow in the dark strands.

EBR06279

pack **£39.95**

H Plastic Strands ABMIX 2

ABS (Acrylonitrile butadiene styrene) is a copolymer which is made of styrene, acrylic and butadiene. Each strand produces up to 3.5m of art. Contains: 5 each of white, brown, blue, purple and grey.

EBR06280

pack **£25.11.95**

I Plastic Strands ABMIX 5

ABS (Acrylonitrile butadiene styrene) is a copolymer which is made of styrene, acrylic and butadiene. Each strand produces up to 3.5m of art. Contains: 5 each of yellow, orange, brown, and green.

EBR06281

pack **£25.11.95**

J Plastic Strands PLAMIX 6

PLA is a biodegradable plastic with a shiny surface. Environmentally friendly material, good compatibility and degradation. Each strand produces up to 3.5m of art. Contains: 5 each of black, red, yellow, green and blue.

EBR06282

pack **£25.11.95**

K Plastic Strands PLAMIX 12

Great for creating semi transparent 3Doodles. A stickier plastic great for 3Doodling on windows, metal and other hard surfaces. Made of corn and 100% compostable. For best performance set your 3Doodler to low temp. Contains: 25 x 10 inch straight cut strands.

EBR06283

pack **£25.11.95**

L Retro Flexy Plastics

10 inch straight cut strands, great for doodling flexible, rubbery, bendable items. Flexy doodles have stretchable properties. For best performance set your 3Doodler to high temperature. You can squeeze, stretch and twist your creations. Contains: 25 x 10 inch strands.

EBR06284

pack **£13.95**



Bring Your Design to Life

Arckit is the innovative company that has designed and manufactured the Arckit modelling system, a multi-award winning scaled architectural design tool based on modern building techniques. The Arckit system can be used across both physical and digital platforms, and has the capability to incorporate bespoke 3D printed components. Arckit is an ideal teaching tool for communicating design ideas, inspiring spontaneous creativity within students and encouraging STEM centred learning.



reddot award 2015
winner



Practical Information

Features:

- Re-usable interconnecting modular components that require no glue
- Precision components made to scale
- Components can be integrated with traditional model making and 3D printed materials
- Arckittexture sheets – apply detailed surface texture finishes for a complete finish
- Arckitdigital – components are available within SketchUp 3D Warehouse, and also in Revit from 2016
- Arckit Infinity 3D store – a bespoke range of 3D printed components designed by Arckit and the Arckit community will be launching in 2016

Benefits:

- Cost effective and practical for everyday use
- Allows users to design, build and modify architectural model structures faster than ever before
- An evolutionary, freemium system with new components being regularly developed that will keep students engaged

A Arckit GO

- Number of pieces/components: 160+
- Arckittexture Library: Yes (adhesive sheets not included)
- Arckit Digital: Yes
- Add on components available

E8R06270

pack £58.95

B Arckit 60

- Possible floor area: 60m² – 650ft² (to scale)
- Number of pieces/components: 220+
- Arckittexture Library: Yes
- Arckittexture Adhesive Sheets: 5
- Arckit Digital: Yes
- Add on components available

E8R06271

pack £106.95

C Arckit 240

- Possible floor area: 240m² – 2583ft² (to scale)
- Number of pieces/components: 620+
- Arckittexture Library: Yes
- Arckittexture Adhesive Sheets: 10
- Arckit Digital: Yes
- Add on components available

E8R06272

pack £322.95

Ideal for the introduction into understanding and investigating smart materials as well as inspiring creativity.



An amazing paint formula which changes from opaque to transparent when it gets wet. As the surface dries it returns to its opaque state. Size: 50ml.

each **£10.95**

The amazing Ferrofluid is a truly magnetic liquid that consists of micron size magnetic particles (magnetite) in a mineral oil. Particles are coated in a surfactant which prevents them clumping together. When a magnet is in close proximity the magnetic particles in the Ferrofluid take up the shape of the magnetic field – a 3D version of the classic iron filings on a piece of paper experiment. Supplied in a plastic jar containing 10mL of Ferrofluid. A rare earth magnet is also supplied.

each **£11.95**

Introduce lighting effects to textile designs with this kit and demonstrate electricity in a fun and creative way. Soldering is not required, instead conductive thread is used to connect the battery and LEDs. Each kit includes 2m of conductive thread (which is a thread that can be used like cotton thread but conducts electricity like a wire), our own custom designed Sewable Coin Cell Holder, one coin 3V cell battery, and two ultra slim, pre-mounted, easy sew E-Textile LEDs. Please note that this product is not washable/dry cleanable and can be used on textile applications which are ornamental and not intended to be washed/dry cleaned or alternatively use on removable textile appliques for garments/soft furnishings/fashion accessories.

each **£4.99**

pack 10 **£47.95**

2 meters of conductive thread that electrically conducts allowing electronics to be integrated into textiles. This makes it ideal for use in a range of E-textile applications.

each **£1.79**

These ultra slim, pre-mounted E-textile LEDs from Electro-Fashion run off a 3V coin cell battery and are illuminated continuously when powered. They have connections to which the conductive thread can be connected. These are clearly marked with '+' and '-' to indicate which is the positive and which is the negative connection. The PCBs are double sided making the conductive thread connection very reliable.

Contents: 5 x individual LEDs (ready to use). 1 x white, 1 x blue, 1 x red, 1 x green, 1 x sakuru (lilac). Dimensions: L15 x W6.5 x H2.7mm.

pack 5 **£3.99**

This sewable push switch used to activate your E-textiles project whilst it is pressed down. It has two connection points to which the conductive thread is connected.

each **£1.08**



D

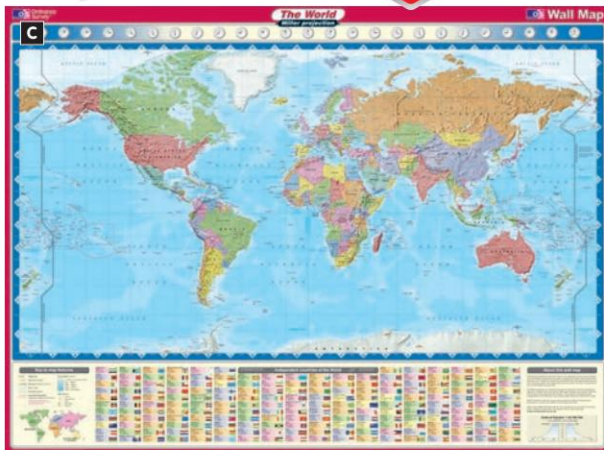
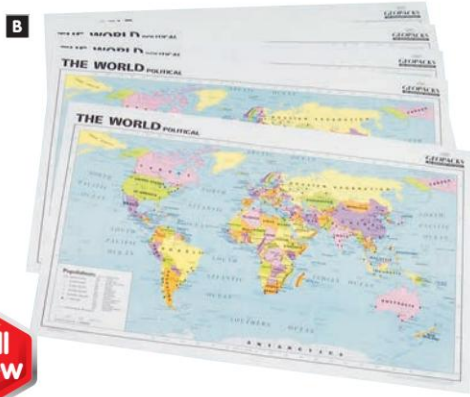


E



Ideal to help students learn about the natural environment and apply scientific skills to the world around them.

Set 2 **£59.95**



A Political Map of the British Isles

A set of 5 paper maps clearly showing the borders between England, Scotland, Wales and Northern Ireland. Counties are shown in different shades. Cities and towns, major road and rail routes, national parks and physical features are named. Printed in the UK using modern digital cartography.

EBR06188 pack 5 **£43.95**

B Political World Map

Both inexpensive and practical, these paper wall maps are extremely versatile as a day-to-day teaching tool. The map has large, clear details and vibrant colour making it an easy to use reference tool. Size of each map is 960 x 630mm.

EBR06186 pack 5 **£27.95**

C Miller Projection World Map

From the Ordnance Survey, these maps display the world with capital cities, time zones and national flags. This political edition with physical features shows countries with political colourings and gives population details. Physical features include vegetated or barren land and mountain ranges are clearly defined. Size: 1300 x 960mm. Scale 1:35,000,000.

EBR06187 each **£23.95**

D Political Globe

This 300mm fibreboard globe features striking cartography in a political format. It has raised relief on the landmasses and over 4000 place names and pieces of information. The globe ball is mounted on a durable plastic base and graduated meridian and comes supplied with an information booklet suitable for use as teacher's notes. Assembled in UK using recycled and recyclable materials sourced in USA.

EBA33996 each **£34.95**

E Physical Relief Globe

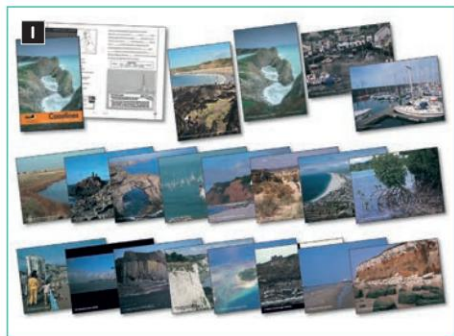
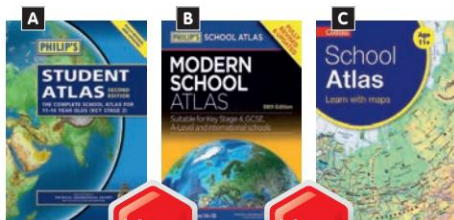
A sturdy globe with clear physical relief details. Mounted on a strong plastic base. Supplied with an updated global reference guide booklet. 300mm diameter. Assembled in UK using recycled and recyclable materials sourced in USA.

EBR06192 each **£34.95**



**BROWSE OUR
ENTIRE RANGE
ONLINE AT**

www.findel-international.com



A Philip's Student Atlas
Designed for work leading up to GCSE and Standard Grade and well suited for lower secondary work, and upper primary. Carefully designed to be uncluttered and easy to read. Symbols and scale information accompanies every map. Fully up-to-date, the atlas includes a 16-page UK and Ireland section and a 42-page world section. 96 pages. Size: 300 x 224mm.

EBR06194 each **£8.99**

B Philip's Modern School Atlas
Recommended for GCSE. Colour coded pages for easy reference. Divided into 4 main sections for ease of use: British Isles physical and thematic maps, World topographical maps, World thematic maps and a new section on satellites and remote sensing. 176 pages. Size: 285 x 224mm. Hardback.

EBR06196 each **£15.95**
EBR06195 pack 5 **£71.95**

C School World Atlas
Featuring 96 pages of clear, easy to read maps, satellite images, an atlas skills section and hundreds of statistics. The content adheres closely to the requirements of the National Curriculum and incorporates results of classroom testing. Also ideal for helping transition of primary to secondary level.

EBR06193 each **£10.95**

D Compass
A budget compass - perfect for teaching mapping skills.
EBR058816 each **£7.79**

E Coasts Poster
A colourful and informative poster with excellent photos of typical coastal features such as headlands, wave-cut platforms, caves and sand dunes. Each photograph is accompanied by a brief and clear explanation of how the feature is formed. Size: 1000 x 700mm.

EBR06189 each **£11.95**

F Coastal Features A1 Poster: How Are They Formed?
This combination of photographs and annotated diagrams provides clear explanations of the processes that lead to the formation of common coastal features. The poster divides the features by process, so adding to pupils' understanding, and the photographs supply real examples to underpin the learning.

EBR06185 each **£13.95**

G Water Cycle Poster
This poster has a detailed diagram of the water cycle and includes colour photographs illustrating and the processes involved. It also features clear definitions of the relevant vocabulary.

EBR06183 each **£11.95**

H What's That Cloud? Poster
This poster will help pupils identify cloud formations, with photographs of clouds and some background information about the clues to be found in cloud names.

EBR06182 each **£11.95**

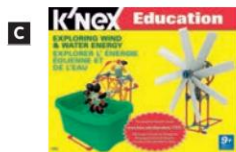
I Coastlines Photopack and Book
This photopack is ideal for work investigating coasts. It contains 20 laminated photographs of a variety of coastal features including cliffs, arches, stacks, caves, headlands and coral reefs. Also included are photocopyable teachers' notes and pupil activities.

EBR06184 each **£23.95**

J Aero Image Deskmats
Featuring a recent aerial photograph of your school (or chosen area), alongside an Ordnance Survey map of the same area at the same scale (approximately 1:7000). The image will cover an area of 1.45km from west to east and 2km from north to south. Size: 420 x 297mm (A3).

Direct Delivery - up to 2 weeks

EBR06191 pack 5 **£47.95**
EBR06190 pack 15 **£107.95**



A Air Pollution - Lichen Identification Charts

A set of colour charts that show how lichen distribution changes with different levels of sulphur dioxide in the air. By identifying the lichens present in an environment, levels of air pollution can be predicted.

Direct Delivery - up to 10 days

E8A29683

pack 10 **£28.95**

B See-Through Compost Containers

3 separate compartments enable students to view the entire decomposition process clearly and make side-by-side comparisons between different materials. Includes thermometers to demonstrate temperature changes too. Includes W300 x L200mm plastic box with 3 clear-view compartments featuring aeration holes and magnification spots, 3 thermometers and an activity guide.

E8R05674

each **£40.95**

C Exploring Wind and Water Energy

Go green and bring STEM concepts to life with the K'NEX® Exploring Wind and Water Energy Set! Designed to address critical science, technology and engineering concepts in the student's classroom and provide instructional models that will enhance student's understanding of these important concepts. Using K'NEX® and the lessons provided in the teacher's guide enables you to offer student's a program of study that uses hands-on exploration in conjunction with an engaging inquiry-based approach to learning. As student's work co-operatively they are encouraged to work together as they build, investigate, discuss and evaluate concepts, ideas and designs.

Set includes 288 K'NEX® parts - enough to build 6 renewable energy models, 2 at a time. Supports 1-2 students. Building instructions and comprehensive teacher's guide aligned to STEM included. Packaged in a strong storage tub with snap-on lid.

E8R05632

pack **£77.95**

D Biodegradability Kit

An innovative Environment Science Kit used to conduct experiments to demonstrate materials bio-grading in compounds and liquids of their choice (not supplied). The kit comes with six specially designed containers and a number of clips and cages to hold the materials in place. Supports the teaching of Geography and Science within the National Curriculum framework.

E8R02076

kit **£52.95**



A The Water Cycle

Students explore where water comes from and how it affects every aspect of their lives. Step by step, they discover how much water people, animals, plants and industry need to survive. The game enables them to learn about the complexity of the water cycle and how the planet recycles it. Learn about:

- The water cycle
- Amazing facts about water
- How much water we use
- How we can save water

Includes game board, 24 jigsaw pieces, 4 counters, extensive teacher's notes in 4 languages and 1 dice. For 2 to 4 players.

EBR05675

each **£17.95**

B Water Cycle Model

This model investigates the water cycle, acid rain, pollution, evaporation and condensation, fresh water from salt water and how materials change. It is simple to set up and operate.

Choose whether to fill the ocean with fresh water, salt water, diluted vinegar or any other safe "pollutant". Load the cloud with ice and switch on a lamp. The water cycle will begin and rain will fall over the hills and run into the rivers and lake before flowing into the sea. The rain is not melted ice, which is self-contained. The Rainmaker lid remains clear enabling the water cycle to be observed.

The instructions provide full details for quickly and easily making safe organic indicators. Raindrops, rivers, lake and sea can then be tested to determine whether they are neutral, acid or alkaline.

Experiments can be conducted using food colouring or brown sugar as "pollutants". Investigate how we can help nature and protect the environment.

Full teacher's notes, with experiments and instructions are included. Lamp not supplied.

EBR05673

each **£63.95**

C General Water Testing kit

The HI-3817 combination test kit offers all the necessary equipment for accurate and reliable water quality testing. This kit allows you to monitor the most important chemical parameters in water: alkalinity, chloride, hardness, iron, pH and sulphite.

This test kit has all the reagents needed to perform over 100 tests for each parameter (50 tests for iron). pH measurements are performed with our electronic pH[®] pH tester which guarantees more accurate and repeatable readings than litmus paper.

The chemical reagents to perform each test are provided in numerically labelled bottles and are easy to identify. All titration reagents are standardised, and do not require chemical handling to perform the analysis. The HI-3817 is supplied with a convenient hard carrying case, designed with field applications in mind. It will also keep your test kit neat and organised.

- Reagents to perform over 100 tests for every parameter (except iron which includes reagents for 50 tests)

- Electronic pH tester

- Hard carrying case

- Instructions

Alkalinity (as CaCO₃) range: 0-100 mg/L (ppm); 0-300 mg/L (ppm)

Chloride range: 0-100 mg/L (ppm); 0-1000 mg/L (ppm)

Hardness (as CaCO₃) range: 0-30.0 mg/L (ppm); 0-300 mg/L (ppm)

Iron range: 0-5 mg/L (ppm)

pH range: 0.0-14.0 pH

Sulphite (as NaSO₃) range: 0.0-20.0 mg/L (ppm); 0-200 mg/L (ppm)

EBR06181

set **£316.95**

D pH Combination Buffer Solution Kit

pH calibration pack containing 10 ready mixed sachets of pH4.01 and pH7.01 calibration solutions (5 each). Simply tear off the top and insert pH electrode or tester into the sachet.

EBR06174

pack 10 **£17.95**

E Hanna Pocket Phosphate Checker

The HI-713 Hanna Phosphate Checker bridges the gap between simple chemical test kits and professional instrumentation. With 0.01 mg/L (ppm) resolution it provides an accurate digital readout of Phosphate levels in water. Easy to use, with accurate results every time, a large LCD display and auto shut-off to ensure longer battery life.

The HI-713 Phosphate Checker also comes complete with 2 sample cuvettes, 1 black cuvette cap, starter pack of 6 reagents for Phosphate, 1 x 1.5V AAA battery and full working instructions.

EBR04647

HI-713

each **£57.95**

F Hanna Pocket Alkaline Checker

Designed exclusively for salt water aquariums, the Hanna Alkaline Checker offers a quick, easy and highly accurate method of checking one of the most important water parameters for salt water aquaria. The HI-755 Alkaline Checker comes complete with 2 sample cuvettes, 1 black cuvette cap, 30ml liquid reagents for Alkalinity, 1 x 1.5V AAA battery, syringe and full working instruction.

EBR04648

HI-755

each **£50.95**

A



**Horizon
Educational**

These award winning kits will open student minds to the wonder of renewable energy science. All kits include a comprehensive textbook (CD ROM and online), manuals, teacher notes, classroom guides and animated flash demonstrations.

B



A Hydrocar

Introducing the hybrid technology that is fueling today's automotive revolution! Hydrocar demonstrates a complete, clean-energy system with solar to hydrogen power generation. Powered by electricity from sunlight, the reversible fuel cell illustrates the principles of water electrolysis, separating hydrogen from water and then recombining these elements to create power in an extremely efficient process. What's more, the car can steer independently to avoid running into obstacles. Size: L63 x W44 x H35cm.

EBR06180

each £155.95

B i-H2GO

Drive the most technologically advanced toy car on the market. Harness the power of sunlight to charge the hydrogen refueling station via the solar panel. Use the station to generate hydrogen through water electrolysis, refuel the car and charge up the super capacitor. Transparent casing and LED lights are designed to highlight all the electrochemical processes - the same processes as in real-scale hybrid vehicles. Control the car using an iPhone or iPad and engage gyro-steering to turn the i-H2GO's wheels simply by tilting your device. Size: L15 x W31 x H25cm.

EBR06179

each £166.95

C



C H Cell 2.0 30W

Create your own hybrid hydrogen-electric applications. H-Cell replicates the technology of real-scale hybrid vehicles improving electrical batteries with the addition of hydrogen fuel that has extremely high density. Acceleration is still drawn from the existing batteries while the H-Cell provides hydrogen power for cruising. With H-Cell the vehicle can run up to four times longer than with the battery alone. Optimised for 1:10 scale vehicles. Size: L40 x 28 x 9cm.

EBR06175

each £1138.95

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QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



A



Horizon
Fuel Cell Technologies

A Micro Fuel Cell Science Kit

Explore the future of energy storage with the Micro-Fuel Cell kit. Power a mini turbine by converting solid state hydrogen in the Hydrostik Pro metal hydride cartridge into electrical energy via the PEM fuel cell. The process is a model for all micro fuel cell systems and a working example of solid hydrogen storage. Size: L21 x W15 x H10cm.

E8R06176

each £166.95

B

B Hydrofill Pro

The world's only on demand hydrogen supply system for refilling Hydrostik Pro metal hydride cartridges. By generating hydrogen through water electrolysis, Hydrofill enables homes and classrooms to become energy self-sufficient. Perfect for next generation science kits and engineering projects. Size: L17.5 x W20.8 x H26.7cm.

E8R06178

each £814.95

C

C Hydrostik Pro

Convenient hydrogen storage to fuel your hydrogen powered devices. Hold the latest hydrogen storage technology in the palm of your hand. Rather than compressing hydrogen gas, the safe, and reliable Hydrostik binds hydrogen with a metal alloy to form a solid metal hydride. Size: L9 x W4.8 x 4.7cm.

E8R06177

each £34.95



C



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exportsales@philipharris.co.uk

A



B



C



D



E



A Axis Wireless Weather Station (digital)

- Outdoor/ indoor temperature
 - Humidity
 - Weather forecast (with barometer) by symbols
 - Radio controlled clock with alarm
 - Date display
 - LCD backlight
 - Storage of min/max values
 - Outdoor temperature measuring range -40°C up to 65°C
 - Can be wall mounted or free-standing
 - Includes one outdoor sensor
- Weather Station:
185 x 90 x 58mm (in silver)
2 x 1.5 V AA batteries
Transmitter:
110 x 60 x 30mm
2 x 1.5 V AAA batteries
- EBR03197**

each **£28.95**

B Sound Level Meter

- Compact hand-held digital sound level meter. Large 3.5 digit LCD display reads measurements over Low (30-100dB) and High (60-130dB) ranges, with accuracy ± 1.5 dB.
- Frequency range 31.5Hz to 8KHz.
 - Resolution 0.1dB.
 - Selectable time weighting 125mS/sec.
 - Max. hold function.
 - Auto shutdown after 15 minutes inactivity.
- Weight 230g approx. Operates from 9V PP3 battery included. Supplied in a sturdy carry case, with full instructions.

The unit incorporates a tripod mount for long-term operation.

E8R06173

each **£89.95**

C Pocket Size Anemometer

- A hand held anemometer that measures wind speed in mph, m/s, knots, kph and beaufort scale. Maximum and average wind speed. Temperature in °C or °F with wind chill calculation. LCD backlight with battery included.

Specification:

Measuring ranges:

- Wind speed minimum 0.2 m/s maximum 30 m/s
- Temperature range: -30 to +60°C and equivalent in °F
- Dimensions: 140 x 50 x 18mm
- Weight: 54g

E8L12403

each **£65.95**

D Rain Gauge

- Pack of 5 great value, low cost, effective rain gauges that can be spiked into the ground or left out on a hard surface. Read the rainfall from the gauge - or put the lid on and carry it indoors. A brilliant practical resource that will promote students' understanding of weather. Size: 160 x 80mm.

E8R05736

pack 5 **£41.95**

E Weather Vane

- A portable weather vane. The large arrow is free to rotate and will come to rest pointing into the wind. It can be hand held or fixed to a post.

E8A32669

each **£10.09**



A Class Rock Pack

Over 55 geological samples designed to cover the earth science sections of the curriculum. The Class Rock Pack provides a complete lesson. Based around a central laminated flow chart, students can work through identifying igneous, metamorphic and sedimentary rock and soil samples on the basis of their characteristics including texture and permeability. The rocks are supplied in durable plastic containers complete with full Teacher's Notes. Included in the packs are clay soil, sandy soil, oolitic limestone, chalk, sandstone, slate, marble, porphyry, granite, gabbro and basalt.

EBR05672

pack **£43.95**

B Class Fossil Pack

The Class Fossil Pack uses a central laminated flow chart and a mix of replica and genuine fossils to explain the section of the curriculum that covers fossils. The set focuses on the main life groups: separating fossils on the basis of their characteristic features, symmetry and biology. Contents: flow chart, teaching notes, 11 different samples, five of each sample, 155 samples in total. Samples: shark's teeth, preserved plant material, echinoid, crinoid, trilobite, bivalve, brachiopod, gastropod, ammonite, coral, fossil rich limestone. Storage tray included.

EBR05671

pack **£57.95**

C BrainLinks Rock Cycle

The linking card game that explores the world of rocks. Players take turn to link the cards in their hand to those already played. However, if a link is not found, another card must be picked up! The first player to lay all their cards wins.

EBR05362

each **£4.79**

D World Soils Kit

For describing and identifying the reference soil groups of the World Reference Base for Soil Resources. Use is made of soil characteristics, properties and horizons which are combined to define soils and their relationships. Soils are defined by the vertical combination of horizons, occurring within a defined depth, and by the lateral organization ('sequence') of the soil horizons, or by the lack of them, at a scale reflecting the relief or a land unit.

Kit contains:

1. Actisol
2. Andosol
3. Calcisol
4. Chernozem
5. Durisol
6. Ferralsol
7. Gypsisol
8. Nitisol
9. Phaeozem
10. Plinthosol - petroplinthite
11. Solonchak
12. Vertisol

EBR04835

E Hydrocarbons Kit

Petroleum and natural gas are found in the Earth's subsurface with the tools of petroleum geology and are a significant source of fuel and raw materials for the production of organic chemicals. The extraction of liquid hydrocarbon fuel from sedimentary basins is integral to modern energy development. Hydrocarbons are mined from tar sands and oil shale, and potentially extracted from sedimentary methane hydrates. These reserves require distillation and upgrading to produce synthetic crude and petroleum. Hydrocarbons are economically important because major fossil fuels such as coal, petroleum and natural gas, and its derivatives such as plastics, paraffin, waxes, solvents and oils are hydrocarbons.

Kit contains:

1. Cap rock: mudstone
2. Reservoir rock (limestone)
3. Reservoir rock (limestone): oolitic
4. Cap rock A: shale
5. Lignite sample
6. Anthracite coal
7. Bituminous coal
8. Source Rock (oil shale Kimmeridge)
9. Reservoir rock (sandstone)
10. Cap rock B: gypsum
11. Peat sample
12. Oil tar sand, crude oil

kit **£70.95**

EBR04834

kit **£46.95**



A Mineral Specimen Set 1

A collection of 12 mineral specimens. Rock size 2.5-3.5cm.

Set includes: Fluorite Cleavable, Garnet Almandine/Hornblende, Red Garnet, Graphite Pure, Gypsum Alabaster, Gypsum stain spar, Gypsum selenite, Schor, Quartz, Hematite Black, Hematite Red and Horn Blend Massive.

E8R04827

each £26.95

B Mineral Specimen Set 2

A collection of 12 mineral specimens. Rock size 2.5-3.5cm.

Set includes: Actinolite, Kaolin, Kyanite, Chastolite, Limonite, Magnetite Black, Magnetite Lodestone, Malachite, Microcline Pink, Microcline White, Muscovite cleavable and Olivine.

E8R04828

each £26.95

C Igneous Rock Specimens

A collection of 12 igneous rock specimens. Rock size 2.5-3.5cm.

Set includes: Andesite, Basalt, Vesicular Basalt, Diorite, Gabro, Granit Red, Granit Grey, Obsidian Black, Obsidian snow flake, Pumice grey, Rhyolite and Scoria.

E8R04829

each £26.95

D Metamorphic Rock Set

A collection of 12 Metamorphic rock specimens. Rock size 2.5-3.5cm.

Set includes: Amphibolite, Graphite, Granite-gneiss, Hornfels, Marble white, Phyllite, Quartzite, Schistgarnet, Schist Mica, Slate, Red Marble and Garnet skarns.

E8R04829

each £26.95

E Rock Specimens

A collection of 15 rock specimens. Rock size 2-3cm.

Set includes: Amphibolite, Granite, Basalt, Scoria, Rhyolite, Shale, Calcareous Tufa, Sandstone, Conglomerate, Limestone, Slate, Marble, Quartzite, Gneiss and Shist.

E8R04830

each £26.95



A Soil Types

The samples have been air-dried, sieved through a 6mm mesh and packed in containers with two of each soil type, labelled with type, particle size analysis, organic matter content and pH. Each set is supplied with a detailed experimental booklet covering demonstrations of biological, chemical and physical properties plus notes on the agricultural significance of these features. Soil types: chalky soil, organic soil, clay soil, sandy soil, loamy soil, silty soil.

E8L10212

set £49.95

B Rock Board

Perspex display board showing 8 high quality samples of rocks from each rock group. Samples include: Granite, Basalt and Quartz porphyry, Limestone, Shale and Sandstone, Marble and Slate. Photocopiable notes included. Size: 150 x 150mm.

E8A30090

each £18.95

Granite Fragments

C E8A30739

Granite

White S.E. England

1kg

£5.29

D E8A30429

Basalt

Fragments

1kg

£5.29

Chalk Fragments

E E8A30533

Chalk

Chalk Fragments

1kg

£5.29

F E8A31136

Sandstone

Cemented, Pale brown colour

1kg

£5.29

G E8A30879

Limestone

Massive (Carboniferous)

1kg

£5.29

H E8A30569

Coal, Bituminous

Fragments

500g

£3.59

Marble Fragments

I E8A30958

Marble

Fragments

1kg

£5.29

J E8A31197

Slate

Fragments

1kg

£5.29

Minerals

K E8A30946

Malachite

Chips

100g

£5.29

A



B



C



A Erupting Volcano Model

There's nothing like an erupting volcano to get children fired up about science! One half of the detailed cross-section shows the inside, the other is labelled A, B, C and D for assessing knowledge. Includes easy-to-make lava recipe and 330mm clear plastic tray for quick clean up. Size 280 x 330mm and includes fact-filled teacher's guide.

EBR05386

each £39.95

B Geological Faults and Folds Models

Made from highly resilient, environmentally friendly EVA foam. Multicoloured sponge makes it easy to understand deformation and displacement of strata. A transparent film covers the adjoining surfaces so that students can attach them easily. Contains one fault model in 3 parts and one fold model. Dimensions: 20 x 100 x 35mm.

EBR05385

each £2.99

C Geological Faults Model

Demonstrates how the faults affect and change the Earth's surface by comparing the state of the ground before and after the change. The 4 pieces of the model are held together with magnets. Dimensions: 450 x 110 x 150mm.

EBR05355

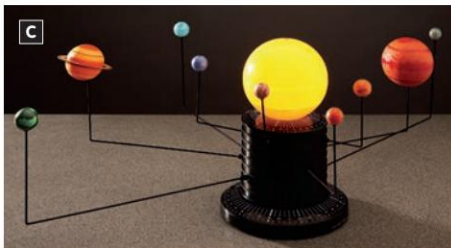
each £171.95



A



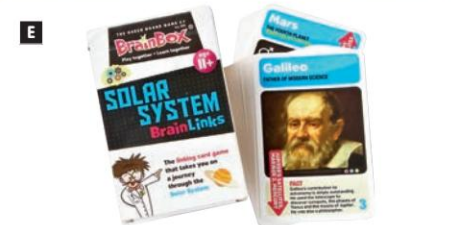
B



C



D



E



F

A Orbit Tellurium 2

A high quality illuminated tellurium with a dual set up designed to demonstrate on a large scale and with a high degree of accuracy the relative movements of the Sun, Earth and Moon. Use the large earth set-up to teach day and night, seasons, length of day, shadows and lunar months, then switch to the small earth setup to demonstrate eclipses and phase of the moon. Teaching notes written for the non-specialist astronomer cover all these topics.

E8A34058

each £282.95

B Helios Planetarium

A fully electric, highly accurate model of the planetary system. The planets from Mercury to Saturn rotate around the sun at their correct relative speeds while the moon orbits the earth. Planets can be correctly positioned according to a calendar and degree scale for any month and year. The star dome shows the stars and constellations visible at night for any given time of year. Change the set up to the earth-centered model to study additional topics including eclipses, phases of the moon and tides. Supplied with a comprehensive teaching manual covering all common astronomy topics and useful tips for demonstrations. Complete with all accessories, a 240V mains power unit fitted with double insulation and thermal cut-out for overload protection. Can also operate with 4 x 1.5VD batteries (not supplied).

E8A34216

each £533.95

C Orrery, Motorised

A motorised orbit orrery with additional 'star dome' to turn it into a simple planetarium. All planets are supported on a central pillar marked with the longitude so that the planets can be arranged in the correct position. The central pillar and support rods are black in colour and 'disappear' when lights are turned out. A four way control switch allows the light and motor to work independently. (N.B. The planets do not rotate with the correct relative orbital period.) Powered by an AC adaptor (not included) or four x C-size batteries (not included).

E8H20562

each £55.95

D Orbit™ Orrery

Demonstrates the overall shape of the solar system and the relative movements of the planets and the Earth's moon. The hands-on model with teaching guide helps pupils understand the solar system including its shape, the sun as the source of its light, planetary orbits, the planets' names and which planets may be seen on given days. The planets, can be rotated by hand around the Sun which lights up while the moon can be rotated around the Earth. The planets are relative in terms of their size as they appear in the solar system.

Overall height: 100mm. Diameter of largest Orbit 38cm. Requires 2 x AA batteries (not included) to light the sun. Teachers notes and battery holder included.

E8A34204

each £24.95

E BrainLinks Solar System

The linking card game that takes you on a journey through the Solar System. Players take turn to link the cards to their hand to those already played. However, if a link is not found, another card must be picked up! The first player to lay all their cards wins.

E8R05363

each £4.79

F Planets Cube

Therapeutic and intriguing, this fact-filled reference tool shows the solar system in perspective and high-impact planet images together with the relative location and size of each planet to the Sun. Open the cube endlessly to reveal more information on every side of the eight smaller cubes contained within.

E8R01200

each £7.19



Infinity 90 Telescope

The Infinity 90 Telescope with 90mm (3.5") Refracting Telescope delivers bright and detailed images that are perfect for viewing both land and celestial objects.

Features a precision Altazimuth mount with slow motion controls that makes it easy to track celestial objects as they move across the night sky.

Includes 3 eyepieces that provide low, medium and high powered magnification for viewing a wide range of objects (Moon, planets, or land).

Bonus Autostar® Suite Astronomy planetarium DVD with over 10,000 celestial objects (Windows® PC only).

Optical Tube Design: 90mm (3.5") aperture refracting telescope

Focal Length: 600mm (f/6.7)

Mount Type: Altazimuth with slow-motion controls on both axes

Optical Coatings: Fully coated glass

Finder: Red Dot

Diagonal: 90 degree erect image

Eyepieces: Three (3) 1.25" MA (26mm, 9mm & 6.3mm)

Barlow Lens: 2X

Viewfinder: Red Dot

Tripod: Pre-assembled full-height stainless-steel tube legs

Accessory Tray: Quick locking design

Assembled Dimensions: 870 x 870 x 1350mm

Assembled Product Weights: 5.34kg

Direct Delivery – up to 2 weeks

E8R06070

each **£274.95**

A



B



All New

All Direct Delivery

A Polaris 114 Telescope

Complete with everything you need to view the wonders of the night sky the first time out. 114mm (4.5") Reflecting Telescope delivers bright and detailed images that is perfect for viewing celestial objects.

Features a larger stable equatorial mount with slow motion controls that makes it easy to track celestial objects as they move across the night sky.

Comes with 3 eyepieces that provide low, medium and high powered magnification for viewing a wide range of objects (Moon, planets, or deep-sky).

Bonus Autostar® Suite Astronomy planetarium DVD with over 10,000 celestial objects (Windows® PC only).

- Optical Tube Design: 114mm (4.5") aperture reflecting telescope with dovetail
- Focal Length: 1000mm (f/8.8)
- Mount Type: Larger-size German Equatorial with slow-motion controls
- Setting Circles: Two (2) axis – RA and DEC
- Latitude Control: Includes scale
- Focuser: Rack and Pinion
- Eyepieces: Three (3) 1.25" MA (26mm, 9mm & 6.3mm)
- Barlow Lens: 2X
- Viewfinder: Red Dot
- Tripod: Pre-assembled full-height stainless-steel tube legs
- Accessory Tray: Quick locking design
- Assembled Dimensions: 885 x 870 x 1520mm
- Assembled Product Weight: 10.12kg

Direct Delivery – up to 2 weeks

E8R06069

each £219.95

B Infinity 50 Telescope

The Infinity 50 Telescope with 50mm (2") Refracting Telescope delivers bright images that are ideal for viewing both land and celestial objects.

Features an altazimuth mount for easy and quick viewing, with 3 eyepieces that provide low, medium and high powered magnification for viewing a wide range of objects (Moon, planets, or land).

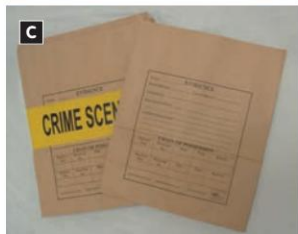
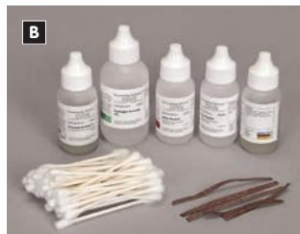
Bonus Autostar® Suite Astronomy planetarium DVD with over 10,000 celestial objects (Windows® PC only).

- Optical Tube Design: 50mm (2") aperture refracting telescope
- Focal Length: 600mm (f/12)
- Mount Type: Altazimuth
- Optical Coatings: Fully coated glass
- Focuser: Rack and Pinion
- Diagonal: 90 degree erect image
- Eyepieces: Three (3) 1.25" (H20mm, H12mm & SR4mm)
- Barlow Lens: 2X
- Viewfinder: 5x24 optical
- Tripod: Pre-assembled full-height aluminum
- Accessory Tray: Included
- Assembled Dimensions: 740 x 740 x 1325mm
- Assembled Product Weights: 1.3kg

Direct Delivery – up to 2 weeks

E8R06071

each £71.95



A Crime Scene Investigation Kit

A fascinating exploration of the science of criminal investigations. Examine and gather the physical evidence of a crime scene, perform various tests to analyse the evidence, identify the crime's victim through dental records and fingerprints, perform tests to determine the cause of death and analyse evidence to determine a suspect. Contains enough materials for up to 40 students.

The crime scene investigation kit covers many scenarios, including:

- Crime Scene One
- Crime Scene Two
- The Music Room Murder
- Fingerprint Records
- Stomach Content Analysis
- Hair Analysis
- Karyotype Analysis
- Tool Mark Analysis
- Fibre Analysis
- Shoeprint Analysis

EBR05365

kit £115.95

B Presumptive Blood Test Kit

Perform the classic 3-step Kastle-Meyer test for blood using the premixed solutions in this convenient kit. In the test's final step, the sample is treated with hydrogen peroxide, which reacts with hemoglobin and phenolphthalein to produce a bright pink colour.

The test detects both human and animal blood. Includes instructions and materials sufficient for 30 tests.

EBR04653

kit £31.95

C Evidence Collection Bags

These evidence bags, designed for your students by real experts, bring authenticity to mock crime scenes and help emphasise the importance of preventing contamination, integrity and continuity of evidence.

EBR04673

pack 10 £8.39

D Evidence Collection Swabs

Bring authenticity to mock crime scenes with our blood and fluid collection swabs. Complete with pro forma labels, they can be used to highlight the importance of integrity when recording and gathering evidence at the scene.

EBR04674

pack 10 £6.59

**GLOBAL
DELIVERY AND
AWARD-WINNING
SERVICE**



A Fingerprint Kit for Non Porous Surfaces

This individual fingerprint kit, containing authentic professional equipment, has everything needed to facilitate:

- Finding, developing and lifting latent fingerprints from non porous surfaces
 - Inking and rolling fingerprints
 - Classifying and identifying fingerprints
 - Understanding the biology and history of fingerprints
- Includes brushes, aluminium powder, pad of 30 lifters and mounts, ink pad, pad of 30 inking sheets, magnifier, identification chart, instructional powerpoint CD designed to provide the basis of a lesson and handbook containing background information sufficient to assist teachers with even limited knowledge of the subject.

EBR04670

kit £62.95

B Fingerprint Fuming Kit

Super glue fuming kit. Since the 1970's experts have been using Cyanoacrylate (Superglue) fuming to develop latent fingerprints. This kit has been designed for use when a fuming cabinet is not available or for when a degree of portability is required. Comes complete with instructions and safety information. Can be used to develop fingerprints on tin foil, sweet wrappers, grained plastic, black bin liners etc and is reusable.

EBR04671

kit £20.95

C Fingerprint Lifters and Mounts

Low tack adhesive sheets with peel off backing designed specifically to make it easy for students to lift fingerprints developed with aluminium powder. The black mounts make the features of the print clearly visible. Supplied in combination packs of 30 lifters and 30 mounts.

EBR04668

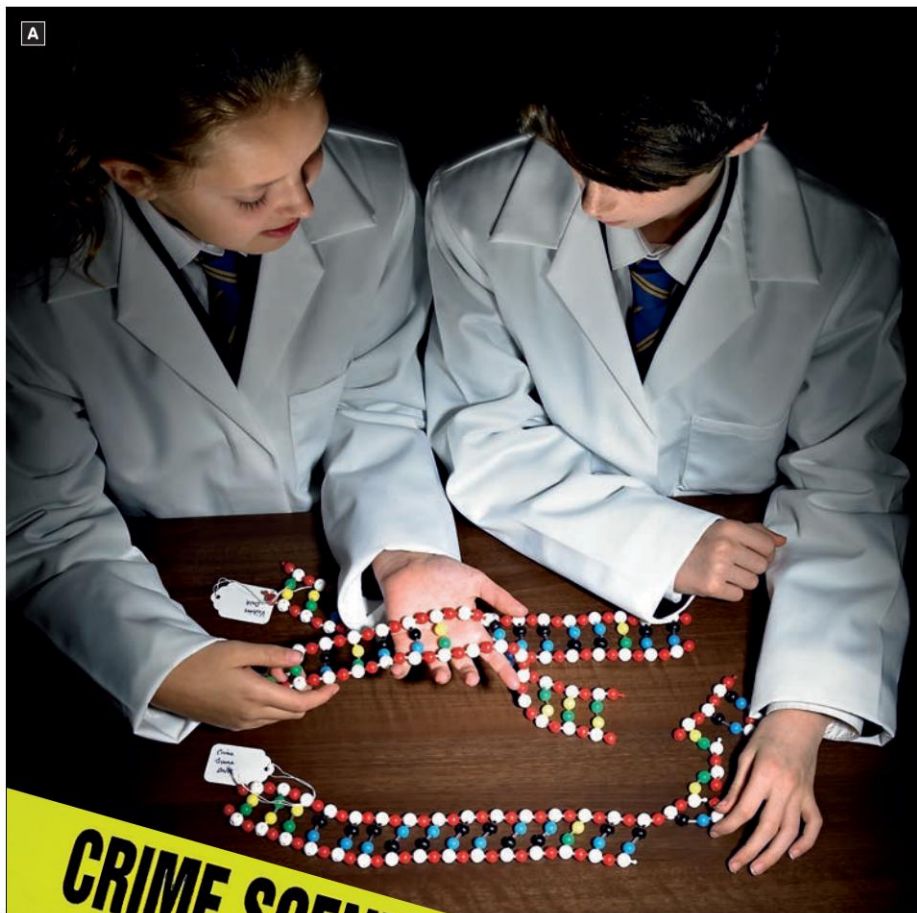
pack £7.79

D Fingerprint Ink Pad

Ideal for use in schools for students fingerprint impressions. Unlike other pads this is filled with fingerprint ink designed specifically to dry immediately on paper and be removed easily from hands with wet wipes or washing in warm soapy water.

EBR04666

each £8.49



A

B

A DNA Murder Mystery

A fun way to learn about a topical, revolutionary technology. Teach your class about the latest innovations in DNA technology and their application to forensic science. Given the completely reusable kit, the class is challenged to solve a murder by simulating each step of the DNA fingerprinting protocol and matching the 'pop bead' DNA fingerprints of suspects versus samples collected at the scene of the crime. Your students will learn the basics of DNA fingerprinting and become familiar with DNA structure and extraction, gel electrophoresis and autoradiography. Contains materials for up to 40 students.

Your students will:

- Simulate the DNA fingerprinting procedure
 - Construct and interpret an autoradiogram
 - Compare and evaluate DNA fingerprint patterns
 - Compare the strengths/limitations of DNA profiling
- Ideal for KS3 and 4.

E8R05368

B Crime Scene Tape

Bring your mock crime scenes to life or just inspire your students by decorating your environment with reusable crime scene tape. Packaged in 5 metre lengths.

E8R04675

each £177.95

each £2.79



A Forensic Chemistry: Document Analysis

The school library's computers have been stolen. Left behind was a ransom note demanding money. Help solve the crime using thin-layer chromatography to separate the ink on the ransom note and ink found in markers tied to possible suspects. It may be possible to provide evidence as to whether or not the ransom note could have been written with a particular marker. Kit contains enough material for 15 groups. Teacher's Manual and Student Study Guide copymasters are included.

Kit includes:

- 3 felt tip markers
- 15 x 30ml chromatography solvent UN1170
- 15 silica gel chromatography sheets
- Capillary tubes

E8R05366

kit **£141.95**

B Forensic Chemistry: Gunshot Residue

This is a two part test to determine whether a surface has been exposed to a discharged firearm. A rapid colour change takes place to verify the presence of nitrates and lead. Kit contains instructions and enough materials for 30 tests.

Kit includes:

- 1 x 5ml diphenylamine sulfuric acid solution UN1830
 - 1 x 0.025g sodium rhodizate
 - 1 x 5ml lead nitrate, 0.05M aqueous solution
 - 20 alcohol swabs
- Ideal for KS3 and 4.

E8R05367

kit **£45.95**

C Shoeprint Impression Kit

This kit is designed to produce shoeprint impressions and casts of exceptional clarity and definition. It is clean and easy to use with mix in the bag powder which, once mixed with water sets within 20-40 minutes. Complete with full instructions and forensic background information on shoeprint and tyre tracks.

E8R04663

kit **£15.95**

NEW SCIENCE LAB?

Looking to fit out a new or renovated school science lab? Wherever you are, whatever your needs, we can help! By partnering with us, we will help you to make the process as smooth and stress-free as possible!

One-stop-shop

Through our wide range of products and supported by an extensive supply base, we will be able to source and supply all the necessary equipment from test tubes to fume cupboards and radioactive sources. Your new lab will be fitted with the best quality, innovative and often exclusive Philip Harris equipment selected for your school's needs.

Bespoke

We are here to quote on your shopping lists or work directly with you or even your architects to provide a customised list of equipment tailored to your school's individual needs.

Expertise

Our team of experts have a wealth of experience setting up labs of different sizes in the UK and around the world. Therefore, if required they can advise a list of equipment suitable to your budget, space, curriculum, class sizes and individual needs.



Contact our team on:
0345 120 4520 or
newlab@philipharris.co.uk

Peace of mind

We will ensure that our products are compatible to your systems, compliant to the latest safety regulations, coupled with warranties and Notes for Use. Furthermore, our no-quibble returns policy will allow you to order in confidence.

After sales care

Once the goods are in your school, we are still here to help: we have a technical team ready to support you with queries throughout the life-cycle of the products. From the installation and set-up of products, to their use in experiments and supply of spare parts, our team are available.

**EMAIL YOUR
QUOTATION
REQUEST TO**

exportsales@philipharris.co.uk



Practical Information

- Reliable results with built in software to ensure correct temperature is reached and maintained
- Safe way to sterilise
- Interlocking safety mechanism
- Fits neatly on a workbench

Autoclaves

Our autoclaves are designed to sterilise equipment and supplies by subjecting them to high pressure saturated steam at 121°C for around 15–20 minutes, depending on the size of the load and the contents. Autoclaving is the preferred method for sterilising/decontaminating equipment, sterilising media and for inactivating waste harbouring micro-organisms.

Classic Media Autoclave

An electrically heated, 9 or 12 litre capacity bench top autoclave designed specifically for the safe and effective sterilisation of media. Dual interlocking handles prevent the lid being removed until the vessel has reached a safe pressure and temperature. Sterilises at 121°C. 9 Litre size: H335 x W236mm, Chamber: Diameter 210 x H236mm. 12 Litre size: H420 x W340, Chamber: Diameter 210 x H328mm. Now with printer option for quick and easy data recording.

Direct Delivery – up to 2 weeks

E8R04363	9 Litre	each £1221.95
E8L75814	12 Litre	each £1341.95

Procedure	Temperature range °C	Holding time at temperature (minutes)
Sterilisation of liquids	121-124 115-118	15 30
Sterilisation of glassware or other equipment	121-124 126-129 134-138	15 (minimum) 10 (minimum) 3 (minimum)
Deactivation of contaminated materials (make-safe)	121-125 126-130 134-138	15 (minimum) 10 (minimum) 3 (minimum)



A Thermostatic Control Electric Autoclave

The ST1528 Portable Autoclave is heated by a single internal element. The temperature is controlled by an electronic temperature controller and a PT100 probe. Fitted with an automatic cut out to prevent it boiling dry. The ST1528 is made from stainless steel with a polished exterior for easier cleaning, the lid is fully removable for full width access and items that are to be sterilised can be placed in the inner liner provided with the machine.

The lid locking device is comprised of six wing nuts and six lid locking lugs, this ensures that the lid cannot be opened while the vessel is under pressure. After the sterilising period a condensing vacuum is drawn to aid drying.

The ST1528 comes complete with:

- Inner liner with handles
- Easy to follow users manual
- Manufacturers safety test certificates
- One year warranty

Features:

- 15 Litre capacity
- Internal Diameter 280mm
- Internal Height 245mm
- Design Pressure: 1.3bar (18 psi)
- Design Temperature 0 - 125°C

- HT Pressure 2.0 bar (30psi)
- SW Pressure 1.3 bar (18 psi)
- Max working temperature 121°C
- Standard working temperature 121°C
- Overall Dimensions 370 x 390 x 489mm (W x D x H)
- Net Weight 19.0kg
- Compact and Fully Portable
- Electronic temperature control
- Simple and safe to use
- Domestic electricity supply
- No plumbing needed
- Minimal maintenance require
- Lid locking safety to H&SE PM73
- Suitable for culture media

Direct Delivery - up to 2 weeks

EBR05395

each £299.95

B High Dome Pressure Cooker

Large 6.0 litre capacity with hi-dome lid, ideal for small load sterilisation. Will operate at 15psi. Suitable for gas or electric radiant ring. Includes perforated separator. Manufactured from quality polished aluminium with black phenolic fittings to BS1746.

EBL78001

each £59.95

C Autoclave Tape

An adhesive tape used in autoclaving to indicate whether a specific temperature has been reached. Autoclave tape works by stripes appearing after exposure to temperatures commonly used in sterilisation processes, typically 121°C in a steam autoclave. Size: 55 metres x 18mm roll.

EBR06055

roll £6.59

D HS Autoclave Bags

Clear bags imprinted with blue biohazard labelling designed for safe disposal. Constructed of 2.0mm thick polypropylene, allowing for repeated autoclaving. Strong side seams for securely holding items. Front write-on panel. Autoclavable at 121°C. Includes 4 inner packs of 50 bags. Bag measures: W415 x L600mm.

EBR05642

pack £71.95

Grant

Grant is a world leading manufacturer of science equipment whose products are known for their high quality, innovative design and reliability.

Their ranges of water baths offer consistent and effective performances, suitable for schools and further education, and their leading technology provides accurate results.



A



B



C



3 Year Warranty

- Fast, effective, efficient, easy and safe cleaning and processing of diverse instruments, components and solutions
- Robust design offers outstanding durability and reliability
- Easy to operate and accurate control of cycle time via simple analogue controls; easy to operate even when wearing gloves

Ultrasonic Water Baths

- Excellent entry level ultrasonic baths
- Time control 0-15 minutes on both baths
- Heated ambient +5°C to 70°C on the 3 litre
- Ergonomic plastic lid - Reduces noise volume and minimises potential of aerosol escape. Included as standard
- Stainless steel basket - Designed specifically to generate maximum ultrasonic activity, prevent items resting on the tank and prevent operators coming into contact with chemical solutions. Included as standard
- Includes stainless steel basket, ABS plastic lid and one bottle of M2 Ultrasonic solution included as standard
- Stainless steel basket and ABS plastic lid forms a drip collection unit to collect excess liquid when the basket is removed from tank
- A choice of 2 sizes

Direct Delivery - up to 7 days

A E80R5650 1 Litre each **£299.95**

B E80R5651 3 Litre each **£593.95**

C Boiling Bath

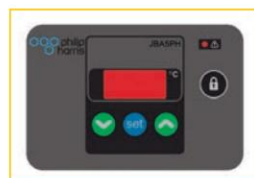
- 5 Litre
- Non-drip polycarbonate lid now included as standard - improves performance, limits evaporation and conserves energy
- Stainless steel tank in a robust outer case - tough and durable in demanding environments
- Constant level device helps maintain required liquid level for optimal operation
- Adjustable energy regulator provides steady boiling
- Large available working area in relation to footprint
- Two over-temperature cut-outs protect users and the workspace if bath is accidentally run without water
- Perforated tray to ensure uniform heat distribution, included as standard
- 3 year warranty

Direct Delivery - up to 7 days

E80R5666 5 Litre each **£767.95**



3 Year Warranty



A Philip Harris Water Bath 5 Litre

E8R06048 each £327.95

B Philip Harris Water Bath 12 Litre

E8R06049 each £372.95

C Philip Harris Water Bath 18 Litre

E8R06050 each £455.95

Direct Delivery - up to 7 days

Philip Harris Water Baths

- Set and Forget™ technology - fast heat-up, reliable temperature control
- Temperature stability $\pm 0.5^{\circ}\text{C}$
- Simple to use controls, clear bright display
- 3 year warranty
- UK design and manufacture
- Display lock - disables front panel controls
- Drain tap, tray and lid included
- Advanced dry start and run dry protection - prevents costly service repairs
- Essential features chosen by users

Grant



3 Year Warranty



JBN Unstirred Digital Thermo Water Baths

- Set and Forget™ technology - fast heat-up, reliable temperature control
- Temperature stability $\pm 0.5^{\circ}\text{C}$
- Simple to use controls, clear bright display
- UK design and manufacture
- Display lock - disables front panel controls
- Drain tap, tray and lid included
- Advanced dry start and run dry protection - prevents costly service repairs

A 5 Litre - Size: 335 x 200 x 215mm

E8R05656 each £442.95

B 12 Litre - Size: 360 x 225 x 380mm

E8R05657 each £514.95

C 18 Litre - Size: 335 x 275 x 590mm

E8R05659 each £646.95

Direct Delivery - up to 7 days

Grant



3 Year Warranty



A Standard - 2 Litre
EBR05654

each £581.95

B Shallow - 2 Litre
EBR05655

each £581.95

Direct Delivery - up to 7 days

SAP2 Unstirred Digital Thermo Water Baths

- Set and Forget™ technology - fast heat-up, accurate temperature control
- Excellent temperature stability - $\pm 0.2^{\circ}\text{C}$
- 3 year warranty
- UK design and manufacture
- User-defined high-temperature alarm - protects samples
- Drain tap, tray and lid included
- Heater mat technology - optimised work space and easy to clean
- Advanced dry start and run dry protection - prevents costly service repairs
- 3 programmable presets, countdown timer, 2 point calibration
- 2 Litre, either standard or shallow depth



Grant



3 Year Warranty



T100 Stirred Water Baths

- Settable temperature range 0 to 100°C
- Easy to use rotary dial and two function keys for quick temperature setting and menu navigation
- Stirred circulation within the bath ensures excellent temperature stability and uniformity
- Easy to view 4 digit display
- Three programmable temperature presets
- Low liquid protection and over temperature cut-out

A Stirred 12L Bath
E8R05660

each £1019.95

B Stirred 18L Bath
E8R05661

each £1055.95

Stirred 26L Bath
E8R05662

each £1109.95

Direct Delivery - up to 7 days

Grant

Exceptional
Science

All
Direct
Delivery

Made
in the
UK

3 Year Warranty



TC120 Stirred Water Baths

- Settable temperature range -20 to 120°C
- Integral pump for external fluid circulation
- Easy to use rotary dial and two function keys for quick temperature setting and menu navigation
- Stirred circulation within the bath ensures excellent temperature stability and uniformity
- Easy to view 4 digit display
- Three programmable temperature presets
- Low liquid protection and over temperature cut-out
- Countdown timer and visual alarm

A Stirred 12L Bath
EBR05663

each £1109.95

B Stirred 18L Bath
EBR05664

each £1139.95

Stirred 26L Bath
EBR05665

each £1199.95

Direct Delivery - up to 7 days



SAVE
when you buy the
NanoHeat® Hot Plate and
the Water Bath Kit

A NanoHeat® Advanced Hot Plate with Water Bath Kit

The NanoHeat® advanced hot plate's compact design enables it to be easily moved and transported. The electronic control ensures reliable bath temperature with $\pm 1^\circ\text{C}$ variance. The temperature adjusts at 1°C intervals. It is easy to set up and carry out multiple experiments simultaneously at different temperatures with several water baths. Its flexible usage allows it to be used separately from the bath container for heating purposes. Operation is from an LED display touch screen allowing easy temperature selection.

Direct Delivery - up to 2 weeks

E8R05241

each £671.95

B Water Bath Kit for NanoHeat® Advanced

Spare water bath kit for NanoHeat® Advanced Hot Plate as above. Advanced hot plate is not supplied with this kit.

- Features:
- Safe to use
 - Energy efficient
 - Compact and easy to store
 - Rapid heating saves time
 - Unique setting allows monitoring of liquid temperature
 - 3 year guarantee

Direct Delivery - up to 2 weeks

E8R05242

each £113.95



CROSS REFERENCE

NanoHeat® Hot Plate Advanced see page 378

A Sprout® Mini Centrifuge

The Sprout Mini Centrifuge is used to microtiter cell separations and HPLC samples. It has an easy and fast rotor exchange designed for easy repeat opening. It is simple to use, safely conscious with an internal safety switch to prevent the lid opening while in use and ergonomically designed to use minimal bench space.

Tubes accommodate circular rotors and adapters combine to hold up to 6 microtubes. Straight rotors hold up to 16 PCR tubes (individual or two strips of 8). It comes complete with three interchangeable rotors to cover all applications, and includes a set of adapters to accommodate all major microtube and PCR tube styles.

Specifications

- Maximum speed: 6,000 rpm
- Maximum RCF: 2000 x g
- Power: 220/230 VAC, 50/60 Hz
- Dimensions: 153 x 128 x 104mm

Sprout® Package Includes:

- Sprout® Mini-Centrifuge
- 6 place 1.5/2.0 mL tube rotor
- 16 place 0.2 mL tube rotor (singles, or 2 x 8 Strip)
- 6 tube adapters 0.2 mL
- 6 tube adapters 0.5 mL
- Storage case for rotors and adapters
- Tube rack
- Power cord
- 2 year warranty

EBR04574each **£167.95****A****2 Year Warranty****B Gusto Centrifuge**

This compact centrifuge is ideal for protocols calling for fast spins with a higher RCF requirement.

- Compact footprint and brush-less motor for quiet operation and low vibration.
- Select and set the digital speed display in xg or rpm
- Sample imbalance and fill safety cut out
- Safety interlock lid prevents opening while rotor is turning
- Back lit display showing time, speed and operational information on the same screen
- Quick-Spin button for short spin requirements
- Suitable for worldwide voltages 110 to 240V, supplied with 4 different plug types
- Made from UV-resistant plastic, increasing its useful life under harsh light conditions
- Double insulated construction
- Push button lid release
- Manual override allows user to open lid in case of power failure

Specifications:

- Speed: 500–12,500 rpm
- RCF: 15–9,800 Xg
- Power: 110 to 240 VAC, 50/60 Hz with 4 interchangeable plug adapters
- Dimensions: 203 x 171 x 114mm

Gusto™ Package Includes:

- Gusto™ High-Speed Mini-Centrifuge
- 12 place 1.5/2.0 mL tube rotor
- 32 place 0.2 mL tube rotor (singles, or 4 x 8 Strip)
- 12 tube adapters 0.2 mL
- 12 tube adapters 0.5 mL
- Universal power adapter 110–240V 50/60 Hz, with 4 interchangeable plug type
- 2 year warranty

EBR05649each **£881.95****B****2 Year Warranty**



A Sea Star® Vortex Mixer

This sleek and modern designed vortex mixer is capable of meeting the mixing requirements of the most popular consumables used in today's lab without the need to swap out head units. The truly innovative design makes maximum use of the space available, providing holding slots for no less than five different sizes of tube and a standard assay plate, while the traditional centre pad can be used for quick hand-held mixing of a vast range of tubes and vessels.

- Variable speed with continuous or pressure activated operation selections
- Stable elastomeric device feet, provide vibration dampening and prevent movement during operation

- Innovative head can be removed for cleaning purposes

- High impact ABS body shell

Specifications:

- Speed Range: Three settings 1000, 2000 and 3000rpm
- Orbit: 4.2 mm
- Control: 3 position switch—continuous, intermittent manual, and off.
- Weight: 8.4lb/3.8kg
- Dimensions: W165 x D165 x H178mm
- 2 Year Warranty

E8R05648

each £239.95

B Microfuge Tubes

These 1.5mL tubes with snap top lids are ideal for collecting small specimens or spinning/separating material in a centrifuge. High clarity natural colour, made from 100% virgin polypropylene. They can withstand speeds of up to 16,400 xg and measure 12.9mm diameter, height 40.2mm. Graduated. Bulk pack of 500.

E8R05667

pack 500 £11.95

C Centrifuge Tubes

15mL, dimensions: OD 17mm length 120mm, graduation 0.5mL, max rcf rating 11,000 x g.

E8R06051

pack 50 £16.95

E8R06052

With rack

pack 50 £17.95



A



A Drying Cabinet

Ideal for drying glassware, or chromatograms and keeping agar based media molten. The cabinet is coated in a corrosion resistant epoxy powder paint, has three chromium plated shelves and toughened sliding glass doors. The unit is equipped with an illuminated power switch and heating indicator light. Suitable for shelf or bench mounting. For use on 200-240 V a.c. supplies. Size: 250 Litre, 660 x 400 x 1000mm.

Direct Delivery – up to 4 weeks

E8A61141

each £1319.95

B Wire Drying Rack

Saves glassware from chips and cracks. Drain and dry test tubes, beakers, flasks and other labware. Place self standing rack on a table or near a sink. Or, use hooks to hang rack on the wall. Holds up to 90 pieces of labware on eighteen 127mm pins and seventy-two 76mm pins. Constructed of spot welded, vinyl coated steel wire for durability. Slide the drainage pan to the side to remove for easy emptying. Overall dimensions 462 x 182 x 525mm.

E8R04649

each £67.95

B



Removable tray to stop excess spillage

**BROWSE OUR
ENTIRE RANGE
ONLINE AT**

www.findel-international.com



Fume cupboards tested by CLEAPSS are safe for use in schools and colleges up to and including 'A' Level. The range complies with Building Bulletin 88 and British Standards: they can help you achieve an excellent BREEAM rating.

For practical science demonstrations: The Airone 1000RS (fully mobile, filtered fume cupboard with 360° visibility).

For classroom and prep-room use: The Airone 1000R fixed filtered fume cupboard.

The Airone range use high quality (CLEAPSS type tested) carbon filters, blended specifically to handle the substances used in the current science curriculum.

A Mobile Filtration Fume Cupboard

- The Airone 1000RS offers excellent flexibility because it will pass through a standard doorway allowing it to be shared between classroom locations
 - 360° visibility makes it ideal for practical science demonstrations
 - 22kg CMS carbon filter and filtrate pre-filter fitted
 - Filter failure monitoring system
 - No ducting required
 - Sliding front sash
 - Large front aperture
 - Integral storage cupboard
 - Restraining stainless steel tether
 - Standard services including: gas and water
 - Single electric socket
 - Energy efficient
- Specifications:**
- External size: 1000 x 700 x 1850mm (WxDxH)
 - Internal size: 840 x 500 x 865mm (WxDxH)
 - Minimum working aperture: 200mm high
 - Maximum working aperture: 365mm high
 - Average airflow: 0.4m/s
 - Voltage: 230V 50Hz 1ph
 - Filter: RS CMS schools filter blended to meet the national curriculum needs for teaching science

Direct Delivery – up to 4 weeks

E8L75383

each **£6143.95**

B Static Filtration Fume Cupboard

- The Airone 1000R is ideally suited for the use in the classroom or prep room
 - 22kg CMS carbon filter
 - Filtrate pre-filter
 - Polypropylene worktop and vulcanite dricup
 - Low airflow alarm
 - No ducting required
 - Sliding front sash
 - Standard services including: gas and water
 - Single electric socket
 - Plain stand
 - Light
 - Energy efficient
- Specifications:**
- External size: 1000 x 760 x 2200mm (WxDxH)
 - Internal size: 950 x 550 x 780mm (WxDxH)
 - Minimum working aperture: 200mm high
 - Maximum working aperture: 365mm high
 - Average airflow: 0.4m/s (alters with sash position)
 - Voltage: 230V 50Hz 1ph
 - Filter: CMS schools filter blended to meet the national curriculum needs for teaching science

Direct Delivery – up to 4 weeks

E8R03188

each **£7932.95**

C Fume Cupboard Docking Station

- Designed specifically to offer additional safety feature within the teaching environment
- Prevents unauthorised access to mains service supplies
- Robust lock and hinges
- Easily sited
- Recess or flush mounted
- Isolated 13amp single switch electric socket

Direct Delivery – up to 2 weeks

E8R03186

each **£438.95**

D Spare Filter

22kg CMS filter for 1000R and 1000RS.

Direct Delivery – up to 7 days

E8R03187

each **£707.95**

Practical Information

Price includes installation for UK deliveries. For non-UK deliveries please contact Philip Harris.



3 Year Warranty



A Stuart Ceramic Coated Hot Plate UC150

Model UC150 has a glass ceramic top which has excellent chemical resistance. The surface is easy to clean and allows high plate temperatures for faster heating. The hot plate has microprocessor control and an innovative LED based true °C temperature setting system rather than simply a 1 to 10 arbitrary scale. The unit can also be used in conjunction with the SCT1 digital contact thermometer to accurately control sample temperature rather than plate temperature.

The "Hot" warning light will flash whenever the plate temperature is above 50°C even when the hot plate is turned off and unplugged from the mains.

Direct Delivery – up to 6 weeks

EBR04379

each £383.95

B Stuart Metal Coated Hot Plate US150

Model US150 has a robust aluminium/silicon alloy top plate for excellent heat transmission. The top plate has a thin ceramic coating for added chemical resistance. A 700W element gives rapid heating and ensures even temperature distribution across the whole surface of the plate. The hot plate has microprocessor control and an innovative LED based true °C temperature setting system rather than simply a 1 to 10 arbitrary scale. The unit can also be used in conjunction with the SCT1 digital contact thermometer to accurately control sample temperature rather than plate temperature.

The "Hot" warning light will flash whenever the plate temperature is above 50°C even when the hot plate is turned off and unplugged from the mains.

Direct Delivery – up to 6 weeks

EBR04380

each £359.95

C Stuart Ceramic Coated Hot Plate Stirrer UC152

Model UC152 has a glass ceramic top which has excellent chemical resistance. The surface is easy to clean and the thermal properties allow very high plate temperatures whilst ensuring the edges stay cooler, reducing the chance of accidental burns. The white surface ensures good visibility of colour changes. The hot plate has an innovative LED temperature indicator scale and can also be used in conjunction with the SCT1 digital contact thermometer to accurately control sample temperature.

The "Hot" warning light will flash whenever the plate temperature is above 50°C even when the hot plate is turned off and unplugged from the mains. Powerful magnets and motor give stirring speeds up to 1500rpm and is capable of mixing large volumes (up to 15 litres).

Direct Delivery – up to 8 weeks

EBR04376

each £461.95

D Stuart Metal Coated Hot Plate Stirrer US152

Model US152 has a robust aluminium/silicon alloy top plate for excellent heat transmission. The top plate has a thin ceramic coating for added chemical resistance. A 700W element gives rapid heating and ensures even temperature distribution across the whole surface of the plate. The hot plate has an innovative LED temperature indicator scale and can also be used in conjunction with the SCT1 digital contact thermometer to accurately control sample temperature.

The "Hot" warning light will flash whenever the plate temperature is above 50°C even when the hot plate is turned off and unplugged from the mains. Powerful magnets and motor give stirring speeds up to 1500rpm and is capable of mixing large volumes (up to 15 litres).

Direct Delivery – up to 8 weeks

EBR04378

each £443.95

Practical Information

TECHNICAL INFORMATION

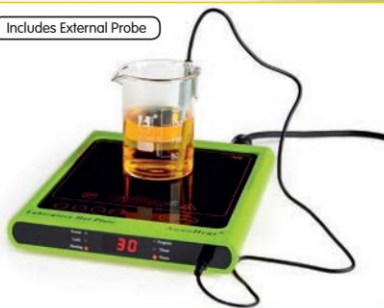
- 60 second warm up
- Compact lightweight design

Direct Delivery

A



B Includes External Probe



SPECIFICATIONS:

Practical Information

Electrical rating: 220-240V, 1200W, 50/60Hz
Dimensions: W200 x L230 x H30mm
Weight: 1.15kg

A NanoHeat® Hot Plate Basic

The NanoHeat® laboratory hot plate is a world first. This elegant and compact unit has been developed using highly efficient heating technology. NanoHeat® Hot Plates have a high performance 60 second warm up time. They have 3 heating levels and multiple warming options for general use. The hot plates are operated using an LED display touch screen and a timer countdown, with a safety lock function and high temperature warning indication. The non-corrosive glass ceramic surface is easy to clean while both glass and ceramic utensils can be used. Their compact and lightweight design makes them easy to transport and store.

Specifications:

Electrical rating: 220-240V, 1200W, 50/60Hz
Dimensions: W200 x L230 x H30mm
Weight: 1.15kg

Direct Delivery – up to 2 weeks

E8R05239

each £293.95

B NanoHeat® Hot Plate Advanced

The Advanced model of the NanoHeat® Hot Plate has all the features that are included with the basic model but also includes an external probe. Using this probe the following operation modes can be used in most experiments:

- High accuracy temperature control in $\pm 1^\circ\text{C}$
- Warming setting in 1°C intervals
- Temperature indications with an accuracy of 0.5°C

The temperature range is from $0-360^\circ\text{C}$. Using the innovative nano-technology this hot plate can heat from $0-300^\circ\text{C}$ in under a minute!

Direct Delivery – up to 2 weeks

E8R05240

each £545.95

Direct
DeliveryIdeal For
Further
Education

3 Year Warranty



Unlike other heating devices, such as hotplates or bunsen burners, heating mantles provide a safe, consistent way of heating. Glassware containers may be placed in direct contact with the heating mantle without increased risk of the glassware shattering, as the heating element is insulated from the container, preventing excessive temperature gradients. In further contrast to other methods of applying heat to a flask, such as a water bath, using a heating mantle generates no liquid residue that may drip off and distributes heat more evenly over the surface of the flask, with less tendency to generate harmful hotspots.

Heating Mantles, Fire Resistant

A range of economically priced heating mantles for round bottom flasks from 50ml to 500ml which include a number of safety features:

- The polysulphide plastic outer casing is lightweight, easy to clean and fire resistant
- A power regulator allows control of temperature to a maximum of 450°C
- The flexible mantle support combines maximum heat transfer with minimum risk of flask breakage
- Efficient insulation inside each mantle ensures a very low outer case temperature, even at maximum power
- The tough metal base has feet to balance the mantle to prevent movement during use
- The efficient element provides a fast warm up to the maximum temperature and is also earthed in case of flask breakage

Direct Delivery – up to 8 weeks

CODE	Flask capacity	Heater power	Dimensions (diameter x height)	Each
E8F66913	50mL	70W	180 x 105mm	£239.95
E8F66925	100mL	105W	180 x 105mm	£269.95
E8F66937	250mL	155W	180 x 105mm	£281.95
E8F66949	500mL	240W	203 x 118mm	£317.95

A range of laboratory incubators that are highly efficient, reliable and cost effective.

Practical Information

INCUBATORS

Our range of incubators are suitable for most biological analysis and general laboratory applications. All units are natural convection models, two are also available with fan circulation and are heated by Incoloy sheathed elements. The temperature control system has a direct easy-read thermostat and an independent overheat thermostat as a safety measure, both with calibrated scales and tamper proof dial locks. Indicators show mains switch, heat and overheat. The exterior is constructed from sheet steel finished with an easy clean powder paint. The interior chamber is made from mild steel coated aluminium and fitted with fixed non-tip shelf runners.



2 Year Warranty

Direct Delivery

Laboratory Incubators

A range of laboratory incubators that are highly efficient, reliable and cost effective. They are suitable for most biological analysis and general laboratory applications. All units are natural convection models, two are also available with fan circulation and are heated by Incoloy sheathed elements. The temperature control system has a direct easy-read thermostat and an independent overheat thermostat as a safety measure, both with calibrated scales and tamper proof dial locks. Indicators show mains switch, heat and overheat. The exterior is constructed from sheet steel finished with an easy clean powder paint. The interior chamber is made from mild steel coated aluminium and fitted with fixed non-tip shelf runners. The units are supplied with chrome plated wire grid shelves and the top vent is fitted with a thermometer clip. All sizes are available with a standard steel door, two models have the option of a visible door.

Direct Delivery – up to 6 weeks

CODE	Capacity, Litres	Temp range, °C	Fluctuation, °C	Additional features	Internal dimensions, mm (h x w x d)	External dimensions, mm (h x w x d)	No. of shelves	Shelf positions	Mass kg	Each
E8A64397	6	+5 to 60	±0.25	Visible door	150 x 230 x 190	390 x 320 x 330	1	1	7	£659.95
E8A64403	18	+5 to 100	±0.25		260 x 260 x 270	520 x 380 x 410	2	2	14	£851.95
E8A64415	18	+5 to 60	±0.25	Visible door	260 x 260 x 270	500 x 480 x 490	2	2	14	£863.95
E8A64427	30	+5 to 100	±0.25		240 x 360 x 350	590 x 610 x 470	2	2	20	£863.95
E8A64439	50	+5 to 100	±0.25		330 x 490 x 330	590 x 610 x 470	2	3	26	£989.95
E8A64440	50	+8 to 100	±0.25	Fan circulation	330 x 490 x 330	590 x 610 x 590	2	3	26	£1193.95

Direct
Delivery

2 Year Warranty

These cost effective, dual purpose oven/incubators are ideal for drying, sterilising and incubating samples in the laboratory.



INCUBATORS

Practical
Information

The control system combines the advantage of two temperature ranges in one unit through the use of a simple high/low switch. Higher temperatures for oven or steriliser use on the high setting and standard incubator settings on the low range. All units are natural convection models, one is available with fan circulation and all units are heated by Incoloy sheathed elements. They also have a direct easy read thermostat and an independent overheat thermostat as a safety measure, both with calibrated scales and tamper proof dial locks. All models have two shelves.

Direct Delivery – up to 4 weeks

CODE	Capacity, Litres	Incubator Temp. range, °C	Fluctuation, °C	Steriliser Temp range, °C	Internal Additional features	External dimensions, mm (h x w x d)	dimensions, mm (h x w x d)	Shelf positions	Mass, kg	Each
E8A64476	18	Ambient +5 to 100	±0.75	40 to 250		260 x 260 x 270	520 x 380 x 410	2	14	£779.95
E8A64488	30	Ambient +5 to 100	±0.75	40 to 250		240 x 360 x 350	500 x 480 x 490	2	20	£929.95
E8A64499	50	Ambient +5 to 100	±0.75	40 to 250		330 x 490 x 330	590 x 610 x 470	3	26	£959.95
E8A64506	50	Ambient +8 to 100	±0.75	40 to 250	Fan circulation	330 x 490 x 330	590 x 610 x 590	3	29	£1313.95
E8A64518	75	Ambient +5 to 100	±0.25	40 to 250		330 x 490 x 450	590 x 610 x 590	3	34	£1439.95



Laboratory Ovens

A range of laboratory ovens that are highly efficient, reliable and cost effective. They are suitable for most drying, sterilising and general laboratory applications. All units are natural convection models, one is also available with fan circulation and are heated by Incolay sheathed elements. The control system has a direct easy-read thermostat and an independent overheat thermostat, both with calibrated scales and tamper proof dial locks. Indicators show mains switch, heat and overheat. The exterior is constructed from sheet

steel finished with an easy clean powder paint. The interior chamber is made from mild steel coated aluminium and fitted with fixed non-tilt shelf runners. The units are supplied with chrome plated wire grid shelves and the top vent is fitted with a thermometer clip. All sizes are available with a standard steel door, one model has the option of fan circulation. Appearance may vary slightly from model shown.

Direct Delivery – up to 6 weeks

CODE	Capacity, Litres	Temperature range, °C	Fluctuation, °C	Additional features	dimensions, mm (h x w x d)	Internal dimensions, mm (h x w x d)	External No. of shelves	Shelf positions	Mass, kg	Each
E8A76727	6	40 to 250	±0.75		150 x 230 x 190	390 x 320 x 330	1	1	7	£719.95
E8A76739	18	40 to 250	±0.75		260 x 260 x 270	520 x 380 x 410	2	2	14	£869.95
E8A76740	30	40 to 250	±0.75		240 x 360 x 350	500 x 480 x 410	2	2	20	£779.95
E8A76752	50	40 to 250	±0.75		330 x 490 x 330	590 x 610 x 470	2	3	26	£857.95
E8A76788	75	40 to 250	±0.25	Fan circulation	330 x 490 x 450	590 x 610 x 720	2	3	38	£1080.95



Our Own Design



Exclusive

**PRACTICAL INFORMATION**

- Ideal for everyday power requirements
- Provides both a.c. and d.c.
- Lockable
- 2 layers of protection

This everyday range of power supplies offers solid support for your lab by being affordable, robust and no nonsense! They are simple, easy to use and represent great value for money.

For the majority of your experiments this range is perfect.

Safe, reliable and competitively priced!

Complies to EN61010 2010, certificates available on request.

Retro Basic PSU

The entry level power supply in the Unilab Retro range. The Lockable Power Unit provides a.c. or d.c. at 2, 4, 6, 9 or 12 volts, at up to 4 amps. This unit is well suited to everyday power requirements, such as basic electricity, ray optics boxes and immersion heaters. The voltage is selected using a five-position switch, and can be locked either at a particular voltage, or within a range of voltages, by way of hex socket screws surrounding the selector switch. An Allen key is provided for the teacher or technician to set the desired locks.

The form of the output is set by a separate switch, either a.c. or unsmoothed, unregulated d.c. Two shrouded 4mm sockets provide the output, and the shroud can be partially unscrewed for other types of connection, such as bare wires. a.c. and d.c. are output from the same sockets, and never simultaneously, preventing students from connecting the a.c. and d.c. outputs together.

The unit has two in-built layers of protection. The first is a thermal trip on the secondary circuit, with a reset button for when the problem load has been disconnected. The second is a 1A mains fuse, accessed from the front panel, on the primary circuit.

E8R04365

each **£105.95**

E8R05930

pack 5 **£459.95**



Practical Information

PRACTICAL INFORMATION

- Ideal for high power requirements
- Continuous a.c. supply up to 15v and d.c. up to 20v (8A)
- Lockable
- 2 layers of protection

Retro Ranger PSU

This is the workhorse of the Unilab Retro range, offering continuously variable a.c. up to 15 volts, and d.c. up to 20 volts, at a combined current of up to 8 amps. This unit is ideal where high power is required, such as high-power quartz lamps or for powering simultaneous experiments.

The voltage is selected by a large knob on the front panel, with dual scale around the outside to indicate a.c. and d.c. voltage setting. It can be locked at a limit by way of an adjustable transparent Perspex disc around the control knob which is secured by a hex socket. An Allen key is provided for the teacher or technician to set the desired locks.

The supply offers simultaneous a.c. and d.c. output from dedicated pairs of shrouded 4mm sockets, and the shroud can be partially unscrewed for other types of connection, such as bare wires.

The unit has two in-built layers of protection. The first is a thermal trip on the secondary circuit, with a reset button for when the problem load has been disconnected. The second is a 2A mains fuse, accessed from the front panel, on the primary circuit. Allen key included.

EBR04366

EBR05931

each **£160.95**

pack 5 **£712.95**



Our Own Design

Exclusive

Retro Regulated PSU

The most sophisticated of the Unilab Retro range, the Regulated Lockable Power Unit offers smooth, regulated d.c. at 2, 4, 6, 9 or 12 volts, at up to 4 amps. This unit is for specialist requirements, such as electronics, or where a constant voltage is required under variable load. The voltage is selected using a five-position switch, and can be locked either at a particular voltage, or within a range of voltages, by way of hex socket screws surrounding the selector switch. An Allen key is provided for the teacher or technician to set the desired locks. The power is output from shrouded 4mm sockets, and the shroud can be partially unscrewed for other types of connection, such as bare wires. The unit has two in-built layers of protection. The first is a thermal trip on the secondary circuit, with a reset button for when the problem load has been disconnected. The second is a 1A mains fuse, accessed from the front panel, on the primary circuit.

E8R04367

E8R05932

each £166.95

pack 5 £779.95

Practical Information

- Ideal for specialist requirements
- Smooth, regulated d.c. supply up to 12v (42)
- Lockable
- 2 layers of protection



Practical Information

BENCH POWER UNIT

Our most popular general purpose power supply.

- Output voltage selected by rotary switch in 1V steps up to 13V
- Long switch lifetime - switch voltage safely at full load without switch contact arcing
- Continuously rated output of 8.5A, a.c. or d.c.
- Internal fan for cool-running under load
- Fully protected secondary, by high speed, resettable electronic trip
- Slow-blow fuse protection for primary
- Additional thermal trip protection for transformer

Recommended for general-purpose laboratory and workshop use by students.

Provides 0-13V a.c. or unsmoothed d.c. in 1V steps at a maximum current of 8.5A. Both a.c. and d.c. outputs may be used simultaneously provided the combined output does not exceed 8.5A. Internal heavy-duty relays enable voltage to be switched whilst on full load without switch-contact problems thus giving a long switch lifetime.

The internal, quiet-running fan will hardly be noticed but it reduces the already low thermal stress in the unit still further, ensuring long life of the instrument. Triple protection is provided by a resettable electronic overload trip, thermal transformer trip and slow-blow fuse on the primary.

Dimensions:

Width: 175mm

Depth: 190mm (including cable clips 206mm)

Height: 298mm

Mass: 4.8kg

E8G85458

EBR06058

each **£129.95**

pack 5 **£615.95**

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and
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IEC cable retainer ensures leads remain attached to units.



Electronic overload with push button reset.

Practical Information

LOCKMASTER POWER UNIT

- Output voltage selected by rotary switch in 1V steps up to 15V
- Long switch lifetime - voltage can be switched safely at full load without switch contact wear
- Continuously rated output of 8.5A, a.c. or d.c.
- Adjustable, maximum voltage lock
- Internal fan for cool-running
- Fully protected secondary by high speed, resettable electronic trip
- Slow-blow fuse protection for transformer primary
- Additional thermal trip protection for transformer

Recommended for general-purpose laboratory and workshop use, particularly in situations where voltage-sensitive components may be damaged by over-voltage. Provides 0-15V a.c. or unsmoothed d.c. in 1V steps at a maximum current of 8.5A. Both a.c. and d.c. outputs may be used simultaneously provided the combined output does not exceed 8.5A. Internal heavy-duty relay switching enables voltage to be switched whilst on full load without switch-contact problems; ensures long switch lifetime. The internal, quiet-running fan will hardly be noticed but it reduces the already low thermal stress in the unit still further, ensuring long life of the instrument. Triple protection is provided by resettable electronic overload trip, thermal transformer trip and slow-blow fuse on the transformer primary.

The maximum voltage that the unit can be adjusted to can be locked to a setting chosen by a teacher (or technician) using a key provided. Now the control knob can be adjusted up to the new setting but no further and protects voltage sensitive components such as light bulbs and motors from damage through over-voltage.

Dimensions:
Width: 175mm
Depth: 190mm (including cable clips 206mm)
Height: 298mm
Mass: 4.8kg

E8G85469

each £135.95

EBR06059

pack 5 £647.95

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TO ORDER

Call

INT: +44 (0) 115 907 4001

ROI: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

ROI: 01 427 3118



Limitlock - insert key to release lock and rotate indicator to new maximum setting. Remove key to lock setting - knob will adjust no further than new setting.



Handle snaps up and down - Spacesaver is easily and safely carried with one hand.



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Improved



Practical
Information

RANGER POWER UNIT

A continuously variable power supply that many teachers choose in preference to a switched unit.

- Output voltage variable by rotary control knob up to 15V
- Continuously rated output of 8.5A, a.c. or d.c.
- Adjustable, maximum voltage lock
- Internal fan for cool-running
- Fully protected secondary by high speed, resettable electronic trip
- Slow-blow fuse protection for primary
- Additional thermal trip protection for transformer

The Ranger is the preferred option for general-purpose student use, where a continuously variable supply is required and where the ability to lock the maximum voltage is desirable.

Provides continuously variable, 0-15V a.c. or unsmoothed d.c. at a maximum current of 8.5A. Both a.c. and d.c. outputs may be used simultaneously provided the combined output does not exceed 8.5A. The maximum voltage, that the unit can be adjusted to, can be locked to a setting selected by a teacher (or technician) using a key provided. The unit has a quiet-running fan that reduces heat build-up when running at heavy load for long periods of time. Triple protection is provided by resettable electronic overload trip, thermal transformer trip and slow-blow fuse on the primary.

Dimensions:

Width: 175mm.

Depth: 190mm (including cable clips 206mm).

Height: 341mm.

Mass: 5.4kg.

E8G85471

each **£179.95**

E8R06060

pack 5 **£863.95**

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Cable stows neatly with wind and clip feature.



Electronic overload with push button reset.

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exportsales@philipharris.co.uk

Practical Information

COLLEGE POWER UNIT

A very popular, advanced, continuously variable power unit now with improved specification and with all the advantages of the Spacesaver case.

- Output voltage variable by rotary knob up to 25V.
- Continuously rated output of 8.5A, a.c. or d.c.
- Internal fan for cool-running.
- Digital display of voltage or current for both a.c. and d.c.
- Fully protected secondary by high speed, resettable electronic trip.
- Slow-blow fuse protection for primary.
- Additional thermal trip protection for transformer

The College Power Unit is a versatile, high specification power unit appropriate for demonstration purposes and for use by students in advanced level courses. Provides continuously variable, 0-25V a.c. or d.c. at a maximum current of 8.5A. The d.c. supply is smoothed by an internal 2200µF capacitor. The a.c. and d.c. outputs can be used together provided the combined current does not exceed 8.5A. By depressing a button switch, a.c. or d.c. output voltages are displayed on a large LCD display. A second button enables current or voltage to be selected. An internal fan keeps temperatures down when running at full load. Triple protection is provided by a resettable electronic overload trip, thermal transformer trip and slow-blow fuse on the primary.

Dimensions:
Width: 175mm
Depth: 190mm (including cable clips 206mm)
Height: 391mm
Mass: 5.9kg

E8G85483

each £275.95

E8R06061

pack 5 £1325.95

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INT: +44 (0) 115 907 4001

RO: 01 427 3100

Fax

INT: +44 (0) 115 907 4002

RO: 01 427 3118



Continuously variable voltage up to 25 Volts at 8.5 Amps. Can display current or voltage.



Handle snaps up and down allowing Spacesaver units to be easily carried with one hand.

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Improved



Practical
Information

EHT POWER SUPPLY

EHT Power Unit suitable for electrostatics experiments and for driving vacuum devices such as the Deflection e/m Tube.

- Continuously variable, 0 - 5kV at a maximum current of 2mA
- Second output with 50M Ω safety resistor
- Auxiliary output, 6.3V a.c. at 1A
- Digital, back-lit display indicating EHT output voltage
- Sockets suitable for standard 4mm plugs or shrouded plugs

The adjustable 5kV output is fully isolated and a backlit, digital meter displays the output voltage.

The adjustable 5kV output is fully isolated and a backlit, digital meter displays the output voltage. An independent earth terminal is provided which enables the negative or positive side of the output to be earthed. There is a mandatory requirement to limit output current to 2mA and, for this reason, there is a safety resistor between the smoothing capacitors and output. In addition to the main EHT output, there is a further output linked by a 50M Ω resistor. This provides an EHT output appropriate for electrostatics experiments with a short-circuit current of 60 μ A. An auxiliary output is provided to drive cathode heaters etc.

Dimensions:

Width: 175mm

Depth: 190mm (including cable clips 206mm)

Height: 341mm

Mass 4.8kg

EBR02653

each **£279.95**

EBR06063

pack 5 **£1367.95**

UNILAB[®]

Our Own Design



Continuously variable up to 5kV. Socket facilitates shrouded or standard leads.

Helpful
Hint

SUGGESTED USE

Electrostatics and Deflection Tube experiments.



CROSS REFERENCE

Deflection e/m Tube see page 185

Practical Information

ELECTROMAGNETICS POWER UNIT

- Output voltage 1-0-1V a.c. and 2V d.c. at 10A
- Unit tolerates short-circuits
- Transformer protected by a thermal trip and slow-blow fuse
- Internal fan for cool running

A power supply specially designed for investigations into magnetic fields associated with electric current and similar experiments, where high current at low voltage is required, and the power supply must tolerate short-circuits.

Dimensions:

Width: 175mm.

Depth: 190mm (including cable clips 206mm).

Height: 298mm.

Mass: 3.4kg.

E8R01306

E8R06062

each **£101.95**

pack 5 **£497.95**

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Handle snaps up and down - Spacesaver is easily and safely carried with one hand.



IEC cable retainer - no more mix-ups with electrical safety tags attached to cables that become separated from the instrument.



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and
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Nine selectable
ranges from
100 μ V to 1V



Practical
Information

SPACESAVER MICROVOLTMEETER

- An effective and robust replacement for a centre-zero galvanometer
- 10 M Ω /V on 100 μ V range - considerably better than a spot galvanometer
- Auto-zero facility

The Microvoltmeter is an effective and robust replacement for a spot galvanometer, with 9 ranges from 100 μ V to 1V. The input resistance of 1k Ω gives 10M Ω /V on 100 μ V range, which is considerably better than a spot galvanometer. The instrument has a large moving coil meter, with auto-zero facility. Input is by way of 4mm sockets or a BNC socket, for very low voltages where a shielded lead is preferred. Suggested uses include: measurement of e.m.f.s from thermocouples, strain gauges and Hall Effect devices, electromagnetic induction measurements, etc.

Dimensions:

Mass: 2.7kg

Size: 175 x 190 (206 inc. cable clip) x 298mm.

EBG85768

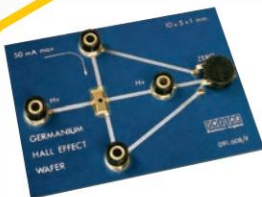
each £191.95

EBR06057

pack 5 £939.95

UNILAB[®]

Our Own Design



CROSS REFERENCE

P-Type and N-Type Hall Effect Experiment Boards
see page 210

Practical Information

SPACESAVER PICOAMMETER

- A very popular instrument housed in the Spacesaver case
- Detect currents as low as 1pA on the 100pA range
- Input voltage up to 5kV
- BNC socket for shielded lead
- Auto-zero facility

The Picoammeter is designed to measure very small currents and has nine ranges from 100pA to 1 μ A, selected by rotary switch. The instrument has a large moving coil meter, with an auto-zero facility. Input is by way of 4mm sockets or a BNC socket, for very low currents where a shielded lead is preferred. Input impedance is 10M Ω and voltages up to 5kV will not damage the unit.

Suggested uses include: measurement of ionisation currents, reverse currents of silicon diodes, resistivities of wood and paper, capacitor leakage current, etc.

Dimensions:

Width: 175mm.

Depth: 190mm (including cable clips: 206mm).

Height: 298mm.

Mass: 2.7kg.

E8G85756

E8R06064

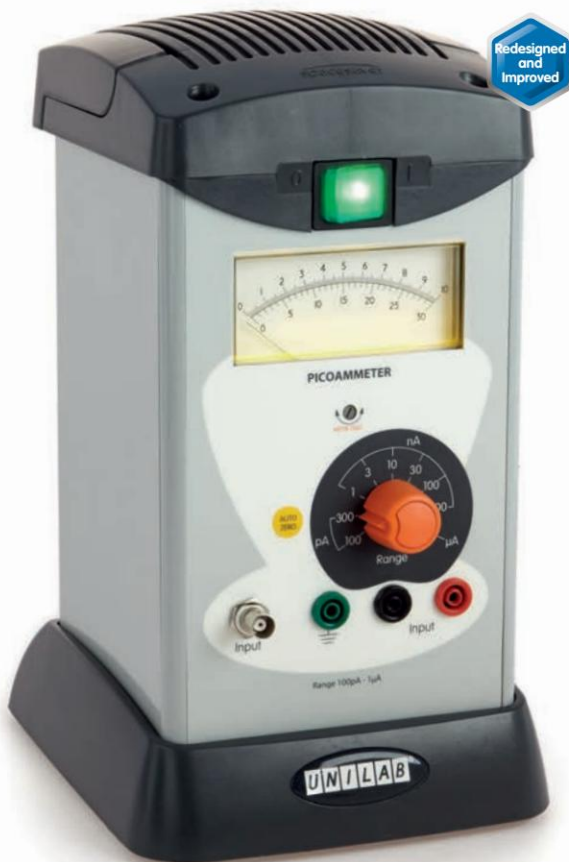
each **£215.95**

pack 5 **£1055.95**

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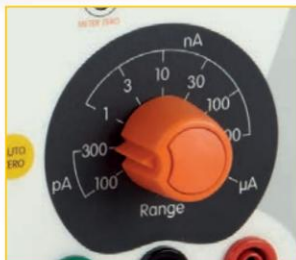


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CROSS REFERENCE

Planck's Constant Kit see page 195



Nine selectable ranges from 100pA to 1 μ A allow current measurement across a wide range.

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Improved



Practical
Information

BENCH SIGNAL GENERATOR

- 10-Hz to 110kHz in four decade ranges selected by rotary switch
- Sine or square waveform selected by push switch with LED indication
- Sine wave distortion 0.5% typical
- Square wave rise time better than 0.25µs
- Output 0-2V rms (5.6V peak to peak) open circuit
- Continuously variable, uncalibrated amplitude control
- Built-in speaker: switch-selected with LED indicator
- Floating output: with separate Earth terminal
- Mains switch: rocker switch with indicator light
- Not suitable for driving a vibration generator

Introduce concepts of analogue and digital waves with the Bench Signal Generator, as the nation switches to digital TV and radio. Signals can be viewed on an oscilloscope, and heard using the unit's internal speaker.

A robust, basic instrument for general laboratory use with all of the advantages of the Sparescover case. Output signal is adjustable over the full audio range and beyond with a low level of distortion. Coarse frequency control is by way of a rotary-switch spanning four decades and a calibrated tuning dial provides for fine frequency setting. Output level is continuously variable up to a maximum of 2V r.m.s. under open circuit conditions. An audible signal from the built-in speaker can be selected by depressing a front-panel membrane switch. A similar switch enables selection of sinusoidal or square waveform, the status indicated by LEDs.

Dimensions:
Size: W175 x D190 x H298mm.
Mass: 3.1kg.

EBG85779

each **£197.95**

EBR06065

pack 5 **£935.95**

UNILAB[®]

Our Own Design



CROSS REFERENCE

Student Oscilloscope see page 221

Practical
Information

SOUND WAVES

Using the output from the Bench Signal Generator the nature of sound waves can be displayed on an oscilloscope like the Unilab Student Oscilloscope.



Four Decade ranges from 10Hz to 110kHz, also includes selectable in-built speaker.

Practical Information

POWER SIGNAL GENERATOR

The Vibration Generator gives mechanical oscillations when fed by signals from a Power Signal Generator. The frequency response encompasses the whole of the audio spectrum and beyond.

- Sine, square, triangular and TTL waveforms available
- Amplitude and frequency modulation
- Instrument amplifier for amplification of signal generator output or external input
- Continuously variable output, low and high impedance
- High impedance output may be attenuated by a factor of 10 or 100 to provide fine control over low level outputs
- Built-in speaker for audible frequency range

The power signal generator is a versatile device, enclosed in our SpaceSaver case. It can produce a wide range of signals, from 0.1Hz to 110kHz, with an output power of up to 5W. There are low and high impedance outputs, with the low impedance protected by a time delay fuse. The unit features an internal speaker that can be turned on and off, and can be used to demonstrate the range of human hearing from 20Hz up to 20kHz.

Frequency control is via a 6 position decade dial and a large continuous dial which controls a multiplier from x1 to x11. There are also dials to control amplitude from 0V to 5V, and attenuation on the high impedance output. Buttons control the shape of the function (sine, triangle, square and TTL), turn the internal speaker on or off, select the modulation mode, and between auxiliary or internal signal.

There are inputs for signal modulation by an external signal, which can be a.m. or f.m., for exploring different types of radio signals, and an auxiliary input for amplification of an external signal instead of the internal function generator, such as from a microphone or music player.

This instrument is ideal for powering large speakers, and is necessary for driving the vibration generator to explore vibrations and waves.

E8G85793 each **£347.95**

E8R06056 pack 5 **£1679.95**

UNILAB®

Our Own Design

Helpful Hint

SUGGESTED USE

As well as driving a vibration generator, this power supply is also suitable for use with a loudspeaker.

Redesigned and Improved



The low impedance output on this unit makes it ideal for powering the Philip Harris Vibration Generator.





A Magnetic Stirrer

Compact, lightweight magnetic stirrer with an ABS plastic housing that is resistant to most laboratory chemicals. Features speed control dial and mains power indicator. Supplied with 25mm long Teflon coated stirrer bar

- Maximum stirring capacity: 1 litre
- Speed range: 100 to 1000 rpm
- Operating conditions: 0 to 50°C, 95% RH
- Mass: 0.6kg
- Dimensions: L120 x W120 x D45mm
- Power requirements: 220/240V, 50/60Hz

E8A82375

each £111.95

B Round Mini Stirrer

A compact magnetic stirrer with impact and chemically resistant ABS case. The stirrer features a variable speed control, 100 - 1000 rpm and incorporates a speed limiter. A green LED indicates "Power on". Supplied with 25mm long Teflon coated stirrer bar.

- Maximum stirring capacity: 1 litre
- Speed range: 100 - 1000 rpm
- Operating temperature: 0 - 50°C
- Humidity: 90% max
- Dimensions: Diameter 137 x H51mm
- Mass: 640g
- Power supply: 220/240V 50/60Hz

E8A82387

each £115.95

C Stirrer Bar Retrievers

A strong permanent magnet in a P.T.F.E. capsule attached to a screw-in P.T.F.E. shaft allows stirrer bars to be removed from vessel without tipping out the contents. Especially useful for vessels with a narrow opening.

Approx 8mm Diameter x L350mm.

E8R02602

each £14.95

D Stirrer Bars, Polypropylene

Convenient assortment of Octahedral magnetic stirring bars presented in a clear transparent storage box. Pack of Twelve.

E8R02601

pack 12 £100.95

E Sea Star® Vortex Mixer

This sleek and modern designed vortex mixer is capable of meeting the mixing requirements of the most popular consumables used in today's lab without the need to swap out head units. The truly innovative design makes maximum use of the space available, providing holding slots for no less than five different sizes of tube and a standard assay plate, while the traditional centre pad can be used for quick hand-held mixing of a vast range of tubes and vessels.

- Variable speed with continuous or pressure activated operation selections
 - Stable elastomeric device feet, provide vibration dampening and prevent movement during operation
 - Innovative head can be removed for cleaning purposes
 - High impact ABS body shell
- Specifications:
- Speed Range: Three settings 1000, 2000 and 3000rpm
 - Orbit: 4.2 mm
 - Control: 3 position switch—continuous, intermittent manual, and off.
 - Weight: 8.4lb/3.8kg
 - Dimensions: W165 x D165 x H178mm
 - 2 Year Warranty

E8R05648

each £239.95

A

**A Stuart Ceramic Stirrer UC151**

Model UC151 has a glass ceramic top which has excellent chemical resistance. The surface is also very easy to clean. The white surface ensures good visibility of colour changes, during titrations for example. Powerful magnets and motor give stirring speeds up to 1500rpm and is capable of mixing large volumes (up to 15 litres). The compact shape takes up less bench space and makes storage easier.

Direct Delivery – up to 8 weeks

E8R04375

each **£275.95**



3 Year Warranty



B

B Stuart Stainless Steel Stirrer US151

Model US151 has a robust stainless steel top plate that does not produce eddy currents like aluminium and so ensures a very powerful coupling and stirring action. Powerful magnets and motor give stirring speeds up to 1500rpm and is capable of mixing large volumes (up to 15 litres). The compact shape takes up less bench space and makes storage easier.

Direct Delivery – up to 8 weeks

E8R04377

each **£269.95**



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exportsales@philipharris.co.uk



A

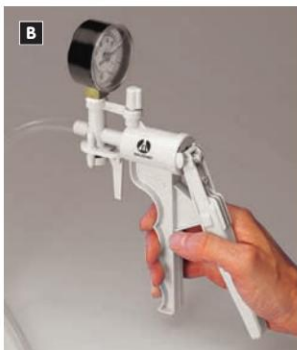


Spares
and
Accessories

**Vacuum Pump Oil
for use with Javac
Pump**

E8R04860 1 Litre £21.95

B



A Javac Vacuum Pump

Rotary vane vacuum pump, oil sealed and ideally suited for use in education. This unit is relatively quiet in use and can be operated for long periods of time. It is robust and engineered for school use. The large oil capacity of 350ml provides for long operation between oil changes. The oil level site glass is incorporated so that the oil can be monitored.

Ultimate vacuum is 25 micron (approx 3 Pa).
Dimensions 330 x 135 x 255mm.
Weight 9.8kg. Air displacement 40L/min.

E8R02971

each **£467.95**

C



B Pump, Hand-operated

This hand operated pump will establish, and hold, a vacuum with a few quick squeezes of the hand lever. The pump is made of high impact styrene mouldings and is self-lubricating, corrosion resistant and maintenance free. The pump nozzle accepts 6mm internal diameter tubing and is equipped with a vacuum gauge and a discharge valve.

- Pumping rate: 15cm³ per stroke
- Maximum vacuum: 120 torr
- Mass: 210g
- Maximum pressure: 50kN/m²
- Outlet and inlet: accepts 6mm internal diameter tubing
- Supplied with 0.5m 6mm vinyl tubing

E8L31744

each **£173.95**

C Pump, Pressure or Vacuum

A quiet running diaphragm pump for pressure or vacuum work. Suitable for use with aquaria, aeration equipment or for providing a stream of gas for chemical reactions. The casing is totally enclosed and fully insulated to class II, ensuring maximum electrical safety (complies with BS5724). The inlet is provided with a removable filter. Supplied with mains lead.

- Diaphragm plates: stainless steel
- Diaphragm: EPDM
- Outlet pipe: 4mm OD Nylon
- Inlet pipe: 4mm OD polypropylene
- Valves and 'O' rings: Nitrile rubber
- Max. free flow: 14 litres per min
- Max. pressure at zero flow: 1.2 x 10⁵ Pa
- Motor type: shaded pole
- Ultimate vacuum: 4.1 x 10⁻² Pa
- Power supply: 240V 50Hz 28W
- Dimensions: 120 x 205 x 140mm
- Mass: 2.75kg

E8A78955

each **£491.95**



A Elgastat B114 Water Deioniser

Using disposable 'Elgacans' the Elgastat is a wall mounted dispenser incorporating a purity meter. Can be connected to any cold water tap and purified water can be drawn until ion exchange resins are shown to be exhausted.

- Max. input pressure: 0.63 Bar (10 psi)
- Max. flow rate: 30 litres/hour
- Water purity: 1-10Mohm/cm 1.0 - 0.1µs/cm
- Resin volume: 0.57 litres
- Mass: 2.2kg
- Dimensions: 380 x 180 x 152mm, height x width x depth

Supplied complete with four 'Elgacans', but WITHOUT battery.

E8A90748

each £572.95

B Elgastat Micromeg Water Deioniser

Compact, wall mounted deioniser producing purified water at a flow rate up to 90 litres per hour. A colour coded conductivity meter is incorporated. By depressing the 'water test' switch, the treated water quality can be instantly monitored.

- Max. flow rate: 90 litres per hour
- Max. input pressure: 3.5 bar (50 p.s.i.)
- Water purity: 1-10 Mohm/cm; 1.0 - 0.1µs/cm
- Resin volume: 4.5 litres
- Dimensions: 550 x 200 x 230mm, height x width x depth

Supplied complete with two resin cartridges, but WITHOUT battery.

E8A90773

each £1343.95

B114 Cartridge Replacement

Replacement cartridge for Elgastat B114 Water Deioniser.

E8R06053

pack 4 £110.95

Replacement Cartridges for Elgastat Micromeg

E8A90785

pack 4 £527.95

Spares
and
Accessories



3 Year Warranty

Practical Information

- All glass construction
- Two independent safety thermostats
- Safety reservoir with full shut off
- Wall mountable
- Silica sheathed heaters

D4000 Distinction Water Still

The Distinction is a simple glass water still with a silica sheathed heating element. Designed to give a reliable performance and has an output of 4 litres per hour of high quality distilled water. The Distinction is supplied complete with a 'reservoir level control' which fits into the distillate collecting vessel and will turn off the heating element when the vessel is full. A built in PTFE drain stopcock and acid funnel allow easy cleaning without dismantling the glassware which protect the still from overheating in the event of cooling water supply failure, or loss of water from the boiler. The Distinction complies fully with IEC1010-1/EN1010-1:1993 and carries the CE mark. The condenser is fitted with screw thread connections for safe and simple hose fitting and removal. The still can be wall or bench mounted.

- Output: 4 litres per hour
- Water supply: Minimum flowrate 1 litre per min, Min pressure 0.2 x 10⁵ Nm⁻² (3 psi)
- Distillate quality: Pyrogen free, Conductivity 1.0-2.0 µS/cm-1, Temp. 25-35°C
- Element power: 3kW, silica sheathed
- Electrical supply: 220-240V, 50-60Hz Single phase
- Dimensions: W540 x D160 x H410mm
- Mass: 6.5K

E8A90839

each £1547.95



3 Year Warranty



AquaTron A4000 Water Still

An electronically controlled water still that is capable of producing a high quality distillate. The still has a unique double pitch coil condenser which produces a low temperature distillate around 25-35°C, allowing immediate use. Features push button switches for ease of operation. A level control device automatically turns off the heater and water supply when the reservoir is full. The still has two safety cut-out devices for protection in the event of coolant or water feed failure. The long life heating element is sheathed in silica glass for maximum purity, to provide high quality pyrogen free output conductivity less than 2µS/cm. It can be used with pre-treated water by using a water feed kit (optional extra). Cleaning is simple and can be carried out without dismantling any glassware. The still is easily installed and can be wall or bench mounted.

- Output: 4 litres per hour
- Pyrogen content: Nil
- pH: at 20°C 5.0 to 6.5
- Conductivity: 1 to 2µS/cm
- Resistivity: at 20°C Mohm /cm²
- Temperature: 25-35°C
- Water supply: 1 litre per minute, 3 - 100 psi
- Power: 220-240V, 50-60Hz, 13A fused
- Dimensions: 550 x 240 x 410mm, width x depth x height

Direct Delivery – up to 6 weeks

E8A90840

each £2639.95

Practical Information

- Fully automatic operation
- High purity pyrogen free output
- Low temperature distillate
- Operates from any raw water supply
- Reservoir level control
- Simple conversion to pre-treated feed
- Supplied with wall mounting bracket
- Safety features allow unattended operation
- Simple to clean



3 Year Warranty



Practical Information

- Glass construction with long life metal heating element
- Two independent safety thermostats
- Wall mountable

Spares and Accessories

Boiler

Boiler for Merit Water Still.

E8A90815

each **£354.95**

3kW Heater

Replacement heater element.

E8A90803

each **£346.95**

Merit Water Still

The borosilicate glass boiler is fitted with a 3kW chromium plated heater, producing distillate flow rates of up to 4 litres per hour which is ideal for the busy laboratory. Its robust metal stand allows bench or wall mounting. A thermostatic cut-out has been incorporated in its design.

- Output: 4 litres per hour
- Water consumption: 1 litre per minute
- Distillate: Pyrogen-free
- Conductivity: 2.0 - 3.0 μScm^{-1}
- Temperature: 25-35°C
- Electrical supply: 220-240V, 50-60Hz
- Dimensions: 470 x 150 x 450mm, width x depth x height
- Mass: 6K

Direct Delivery - up to 2 weeks

E8A90797

each **£971.95**

**GAS TAPS****Practical Information**

Drop lever pattern with standard 3.5mm bore and tamper proof concealed mechanism. Inlets are threaded in. BSP. Consumption 8.4 litres (0.3 cu. ft.) per minute at 200mm water gauge. These taps are designed to operate on natural/town gas mains supplies at pressures not exceeding 0.14kg cm² (2 psi). On no account should they be used on high pressure systems.

**A Drop Lever Gas Tap**

Drop lever gas tap for excellent on/off indication. Comes with all fittings for bench mounting or other horizontal surface. The tap has a flange diameter of 39mm.

E8A65304	Two way 90 degrees	each £48.95
E8R02114	Two way 180 degrees	each £45.95

B Pillar Angle Tap with Fixed Serrated Nozzle, Bench Mounted

Handwheel colour coded for cold water: green with blue centre. Standout: 152mm, height from bench surface: 300mm.

E8A65237	each £80.95
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C Swan Neck Tap

Fixed swan neck tap, colour coded either hot or cold. The cold tap is fitted with a lever handle, allowing for hands-free operation and also benefiting pupils with impaired motor skills. Our left handed taps are 'Hot' and our right handed taps are 'Cold'. Height from bench surface: 342mm. Standout: 152mm.

E8R02122	Hot	each £63.95
E8R02124	Cold WITH Lever	each £77.95

D Swan Neck Mixer Tap with Lever

Balanced flow mixer tap with a removable nozzle. Hand wheels colour coded for hot and cold water. Height from bench surface: 342mm. Stand out: 152mm.

E8R02123	each £175.95
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A

New

Economy Science

The latest Mystrica Colorimeter offers exceptional value for money along with a compact, robust and reliable design and ease of use. It can be used as a stand alone unit or through a computer using the USB cable or wireless (bluetooth 4.0) and the free software, to measure reaction rates, concentrations, enzyme activity, population growth etc. Ideal for use in schools and colleges as the software has been designed to be 'teacher friendly'.

A Wireless Colorimeter

Mystrica 2.0 Wireless Colorimeter combines economy with accuracy, versatility and ease of use. The colorimeter measures absorbance or transmittance of light from red (630nm), green (525nm) or blue (465nm) LEDs.

It can operate as a stand-alone instrument or connected by USB or wireless (bluetooth 4.0) to PCs, tablets or phones. The software for Windows, iOS and Android is free to download and use.

EBR05989

set £551.95

B S-Range Digital Colorimeter

Robust colorimeter featuring a stabilised power supply that maintains a constant light output from a 6V, 0.15A tungsten lamp with infra red filter. There are two absorbance ranges and one transmission range. An automatic gain control provides automatic zeroing by simply pressing a switch and the instrument is insensitive to normal ambient lighting. The eight colour filters are held in a rotatable filter holder. The single cuvette holder takes 10mm path length cuvettes. The instruments have 0-1V output sockets fitted as standard and are compatible with our range of data logging equipment.

- Operating ranges: Absorbance, 0-1 linear and 0-2 linear Transmission 0-100% Max. initial absorbance of reference solution 0.8A, 1.0A, 10%
- Adjustment Automatic: push button zeroing with LED indicator
- Light source: 6V, 0.15A MES
- Filters: 8, 430-700nm (violet to red)
- Detector: Silicon: photodiode
- Output: 0-1V for dataloggers or computers
- Dimensions: 380 x 160 x 80mm
- Mass: 1.5kg Supplied with 2m detachable mains cable, filter disc, spare lamp and dust cover for filter disk and cuvette socket

EBH28068

240V

each £507.95



B

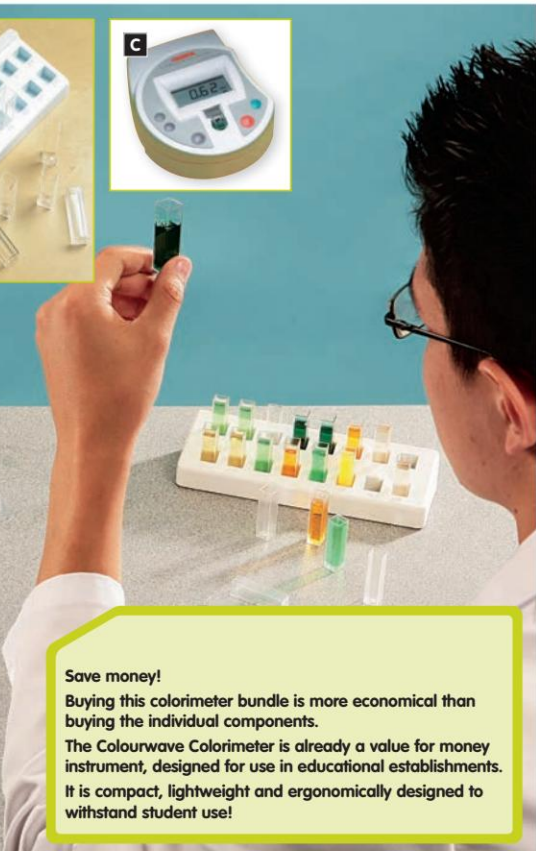
Our Own Design

Exceptional Science

Redesigned and Improved

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Save money!

Buying this colorimeter bundle is more economical than buying the individual components.

The Colourwave Colorimeter is already a value for money instrument, designed for use in educational establishments.

It is compact, lightweight and ergonomically designed to withstand student use!

A Plastic Cuvettes

Parallel sided, 10mm path length.

E8A60069

pack 100 £17.95

B Cuvette Rack

Moulded polypropylene, to hold 20 standard 10mm optical path cuvettes. The holes in the upper tier are specially shaped so that only the corners of the cuvettes make contact with the rack, thus eliminating the possibility of blemishing the optical surfaces. The rack is stackable and is autoclavable up to 120°C. Item may vary from image shown.

Dimensions: L117 x W108 x H111mm.

E8A60082

each £11.95

C Colourwave Colorimeter

This colorimeter is designed with student users in mind. Highly compact and robust, the choice of absorbance or percentage transmission read out allows explanation of the fundamentals of colorimetry. The integral Kinetics mode permits the study of rates of reaction and results can be output to PC, chart recorder or printer. The eight filters are held in an integral filter wheel preventing any accidental loss or damage, however they can be removed if required.

- Range: Absorbance -0.3A to 1.99A, Transmission 0 to 199%T
- Filters: Eight gelatin filters 440 - 680nm range
- Bandwidth: 40nm
- Repeatability: $\pm 0.02A$ at 1A
- Output: Analogue 0-2V for 0-2A, 0-1.99V for 0-199%T. Via 2 x 4mm sockets & Digital RS232
- Cuvette holder: Fixed with drain hole. Accepts 10mm path length cuvettes or 16mm diameter tubes. (Accepts 10 and 12mm tubes with adaptors)
- Power: 240V transformer supplied
- Dimensions: 180 x 150 x 60mm
- Mass: 0.5kg

E8H71612

each £503.95

D Colorimeter Bundle

This bundle contains:

- Colorimeter
- Plastic cuvettes (pack of 100)
- Cuvette rack holding 20 cuvettes

Colorimetry is an extremely useful technique for establishing the presence and concentration of substances that produce coloured solutions. This kit comprises all that you need to make a start in this interesting practical area of conventional

and biological chemistry. The colorimeter is specifically designed to be used in schools by 'higher' level students and those studying AS and A2 Chemistry and can be used for many practical experiments including those on the AQA science course.

Its large, clear digital display and simple push button controls make the instrument very easy to use and ideal for students.

The eight filters at 440, 470, 490, 520, 550, 580, 590 and 680nm are enclosed in an integral filter wheel and the wavelength required is selected by rotating this until the relevant, colour coded, number is visible in the indicator window. The ergonomic design makes this very convenient and filters cannot be accidentally lost or damaged.

Results can be read off the instrument display or the instrument can be connected to a PC where results can be loaded into a spreadsheet. When used in kinetics mode to study rates of reaction the unit takes readings every second and these may be sent to a chart recorder via the analogue output or downloaded to a PC using the RS232 connector. The kit also includes a pack of 100 cuvettes and two cuvette racks (may vary from image shown).

E8R00016

pack £525.95



A Newton Meters

Plastic, tubular newton spring balances. Each range is colour coded for convenience, and is scaled in both grams and newtons. The spring mechanism is clearly visible and zero adjustment is incorporated.
Length: 250mm overall, including ring and hook.

E8A40409	250g, 2.5N	Blue	each	£3.59
E8A40411	500g, 5N	Green	each	£3.59
E8A40423	1kg, 10N	Brown	each	£3.59
E8R01908	1kg, 10N	Brown	pack 10	£34.95
E8A40435	2kg, 20N	Red	each	£3.59
E8A40447	3kg, 30N	White	each	£3.59
E8A40459	5kg, 50N	Yellow	each	£3.59

Set of Six Newton Meters

Includes one each of the 250g, 500g, 1kg, 2kg, 3kg and 5kg Newton Meters as above.

E8A40460	set	£25.95
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B Push/Pull Spring Balance Set

The Push/Pull Spring Balance has been re-thought to give a reading when the force is being pulled AND pushed. Above the spring tube a push rod sticks out of the top of the device so that a force can be measured when it is pushed. A superb invention with numerous uses in mathematics, technology and science activities. They are colour coded and have a clear flat area on the rod so you can create your own scales of measurement using a dry-wipe marker. Marked in grams and newtons. Set of 6: 250g, 500g, 1kg, 2kg, 3kg, 5kg.

E8R06263	set	£31.95
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C Spring Balance, Rectangular Plastic Body (Newton Meters)

Tough moulded body with large, easy to read flat scales. A thumb operated knurled zero adjuster is incorporated, and large suspension rings and load hooks are also provided. Dimensions (including ring and hook): 205 x 41 x 23mm. Scale length: 80mm.

E8L35294	0 to 1N x 0.01N	each	£7.89
E8L35300	0 to 10N x 0.1N	each	£8.79
E8R01909	0 to 10N x 0.1N	pack 10	£59.95
E8R01910	0 to 1N x 0.01N	pack 10	£63.95

D Measuring Weight Kit

A great value kit containing versatile elements to let pupils begin their explorations of weight measurement. A must for any classroom. Contains a primary balance with transparent shatterproof plastic pans on bright plated-steel rod hangers, with locating rings for level fitting. Each pan takes up to 2kg and has a 1 litre capacity. Also contains a 1kg flat pan scale, 1 weight-keeping board, a selection of 8 cylindrical weights, 35 plastic masses and 3 spring balances (2kg, 3kg and 5kg).

E8R06308	set	£137.95
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**GLOBAL
DELIVERY AND
AWARD-WINNING
SERVICE**

Calibration of balances is one of the most important tasks to perform before use especially if the balance has been in transit. The balances are calibrated prior to shipping and we highly recommend that they are calibrated again when received. The effects of both transportation and changes in temperature can have an impact on the balance accuracy. Please contact Philip Harris Technical Support for advice on how to conduct the calibration.



A Calibration Weights

This 1g - 500g set includes the following weights: 1g, 2 x 2g, 5g, 10g, 2 x 20g, 50g, 100g, 2 x 200g and 500g - 12 weights in total.

Direct Delivery - up to 7 days

E8R05774

pack 12 £175.95

B Set of Masses

High value resource for every year of the curriculum. This set of steel and brass masses in a strong storage tray allows children to weigh any item from 10g to 1990g by 10g divisions. Contents: 1 x 1kg, 1 x 500g, 1 x 200g, 2 x 100g, 1 x 50g, 1 x 20g and 2 x 10g masses.

E8R05266

pack £35.95

C Slotted Masses, 100g

10g hanger, nine slotted masses each of 10g. Tolerance $\pm 5\%$. Ideal for general laboratory use. 100g, stainless steel.

E8H27374

set £11.95

D Brass Hanging Weights (Various Masses)

Set of brass slotted weights on a brass hanger. Various masses. Total weight: 438g. Contents: 1 x 20g, 1 x 100g, 1 x 50g, 1 x 20g, 1 x 10g, 1 x 5g, 1 x 2g, 1 x 1g, 50g hanger. 38mm diameter of largest weight.

E8R06244

set £25.95

E Brass Masses Sets

Set of 1000g. Comprises 9 x 100 slotted masses on 100g hanger.

E8E64235

set £21.95

F Slotted Masses, 250g

50g hanger, nine masses of 20g, one of 10g and two of 5g.

E8A73129

set £19.95

G Slotted Masses, 500g

50g hanger, nine masses of 50g.

E8A73131

set £25.95

H Precision Sets, Brass, Nickel Plated

All components $\pm 1\%$ tolerance.

100g set (20g hanger, three masses of 20g, one of 10g and two of 5g).

E8A73118

set £8.59

I Slotted Masses, 1kg

100g hanger, nine slotted masses each 100g. Tolerance $\pm 5\%$. 1kg set of zinc plated steel.

E8A73088

set £10.95



A



B



C



D



E



F



G



H



I



J



K



L

A Metric Trundle Wheel

Clicker can be set to 3 positions (ft, every 100mm or every metre). Moulded in strong plastic with a hard wearing tyre for use indoors or outside.

EBA74111 each **£11.95**
EBR01902 pack 10 **£103.95**

B Height Measure

Measures children from the time they can stand up straight to adulthood (maximum height 2.05m). Comes in its own box for easy storage and transportation.

EBA74159 each **£63.95**

C Clinometer

Modern compact version eliminates the necessity to hold at arms length. Direct sighting through the clinometer or from the side, allowing confirmation of a reading. Angles of a surface can be read and heights of objects can be measured. Suitable for left or right handed use. Instruction leaflet included.

EBR05764 each **£11.95**

D Vernier Caliper - Digital

Accurately reads to .001". Large, easy to read numbers. Instantly convert inches to millimetres and back again. Hardened stainless steel construction for durability and corrosion resistance. "Zero" button for two step measurements with calculations. Inside, Outside, depth and steel measurements. Free-wheeling friction roller for repetitive and accurate readings. Lock for repetitive measurement. Includes battery and instructions.

EBR06309 each **£99.95**

E Sliding Vernier Calliper

IME type. Improved design, plated steel with dual scale 0-15 cm x 0.1 mm and 6 x 1/128", provided with thumb movement for easy motion of jaws, in box.

EBA74196 each **£8.39**
EBR01895 pack 5 **£28.95**

F Tape Measure

PVC coated fibreglass tape measure, extremely resistant to stretching. Width: 13mm, graduated one side every 10mm and figured every tenth of a metre with metre figures in red. In ABS plastic case with re-wind handle.

EBA74068 20m each **£10.95**

G Micrometer

A basic metric micrometer offering excellent value for money with 0.01mm graduation. 0-25mm x 0.01mm.

EBR06348 each **£15.95**
EBR06351 pack 5 **£71.95**

H Classmates 15cm/mm Clear Rulers

Accurate graduations, bevelled edge.

EBR05809 pack 100 **£10.95**

I Classmates 30cm/mm/inch Rulers

Clear plastic rulers, marked and numbered cm, mm and inches. Shatter resistant. Bevelled edge.

EBR05810 pack 100 **£15.95**

J Horizontal Reading Rule, cm and mm

Wooden ruler, length 0.5m. One edge divided into centimetres, the other in centimetres and millimetres. Figured every centimetre.

EBA73829 each **£2.89**
EBR01898 pack 10 **£24.95**

K Horizontal Reading Metre Rule, Both Edges Divided

Wooden ruler, length 1m. Good quality hardwood. Both edges divided into centimetres and millimetres, figured every centimetre. The scales on the 2 edges read in opposite directions.

EBA73842 each **£3.09**
EBR01897 pack 10 **£26.95**

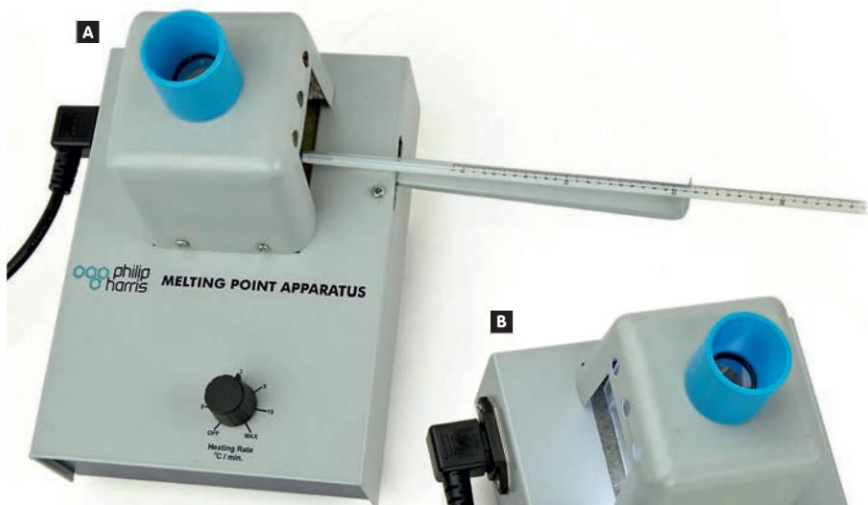
L 1m White Ruler

Dead length. Metric and imperial measurements. Shatter resistant.

EBR05280 each **£3.49**

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Our Own Design



A Analogue Melting Point

Designed for safety, accuracy and ease of operation, this compact, portable scientific instrument is an indispensable bench top tool for determining the melting point of solid substances.

The dual heating block allows for up to a maximum of two samples to be tested simultaneously. A rotary knob is adjusted to vary the heating rates from 0°C/min to a maximum of 20°C/min to heat the sample to its melt temperature. The maximum temperature range is 380°C. The magnifying lens in the eyepiece aided by the illumination provided by a bright white led gives clear view of the sample during its melting phase.

Specification:

- User Interface Rotary Knob
- Temperature Unit °C
- Operating Range Ambient Temperature to 380°C
- Heating Rates 1°C/min to a max of 20°C/min
- Electrical Supply 230V, 50Hz, 50W
- Cabinet Dimensions W185 x D220 x H176mm
- Net Weight 1.2kg

E8R06349

each **£599.95**

B Digital Melting Point

This compact, feature rich and portable melting point apparatus provides a visual means of determining the melting points of solid samples. A user interface consisting of a backlit alphanumeric LCD and a 6 key membrane keypad allows selection, control and display of temperature digitally. The dual heating block allows for 2 samples to be tested at once and will display the temperature in °C, °F or K units. The LCD runs the menu system that directs the user to set options for controlling the melting process.

The apparatus is designed to measure and record the temperatures of crystalline samples held within capillary tubes. Up to two tubes are accommodated simultaneously in an illuminated slot within the heater block. The tubes are viewed through the plastic eye piece fitted with a magnifying lens.

Specification:

- Temperature Resolution : 0.1°C, 0.1°F, 0.1K
- Operating Range: Ambient Temperature to 400°C, 752°F, 673K
- Plateau Temperature: Above Ambient Temperature to 399°C, 751°F, 672K
- Ramp Rates: 20°C/min till plateau, 0°C/min to 10°C/min, 1°F/min to 10°F/min, 1K/min to 10K/min
- Electrical Supply: 230V, 50Hz, 65W
- Cabinet Dimensions: W185 x D220 x H176mm
- Net Weight: 1.4kg

E8R06339

each **£599.95**

Spares
and
Accessories

Melting Point Thermometer

Mercury free - filled with a low toxicity green spirit, calibrated for 'total immersion'. Permanent amber stain graduations. White coloured background provides clear observation of coloured liquid column. Plastic non-roll top and safety suspension ring. Graduation: 1.0°C -10 to 300. Tolerance: ± 3.0°C.

E8R06313

each **£191.95**

Melting Point Capillary Tubes

Glass melting point capillary tubes. Length: 100mm. Diameter: 1.8mm, one end close.

E8R06350

pack 100 **£4.79**



stuart

All Direct Delivery

3 Year Warranty

- Digital selection and display of temperature
- High accuracy
- Simple to operate
- Plateau facility
- Ideal for educational use
- Supplied with calibration certificate
- Easy to clean

Spares and Accessories

Thermometer For Melting Point Apparatus

Spirit filled thermometer, 0-250°C.
E8R04748

each **£35.95**



Exceptional Science

A Stuart Analogue Melting Point Apparatus SMP11

With new safety features the easy to use SMP11 is ideal for use in education. Supplied with a safe, spirit filled mercury free thermometer, the low toxic blue spirit will not pose a health hazard in the event of a breakage. Easy to follow instructions are printed directly on the apparatus.

With a manually adjustable heating rate, the SMP11 will rapidly heat samples up to 20°C per minute to the melt temperature and up to the maximum temperature of 250°C. Accurate readings to within 1°C of the melt temperature can be achieved by using a slower heating rate of between 1 and 10°C per minute.

Up to three samples can be viewed and tested at any one time. Samples are illuminated by a bright white LED and viewed via a magnifying lens. The magnifying lens can be detached for cleaning using the simple to follow instructions printed on the instrument.

- Number of samples: 3
- Temperature range: 50°C to 250°C
- Heating Rate: 1 to 10°C per minute

- Dimensions: 370 x 140 x 110mm
- Net Weight: 1.7kg
- Electrical Supply: 230V, 50Hz, 50W
- IP rating: 40

Direct Delivery – up to 4 weeks

E8R04188

each **£581.95**

B Stuart Digital Melting Point Apparatus SMP10

The SMP10 has been designed with safety and ease of operation in mind making it ideal for use in education. The temperature is selected, measured and displayed digitally eliminating the need for a thermometer. Easy to follow instructions are printed on the front panel. Viewing is via an illuminated magnifying lens. Two samples can be observed simultaneously. The viewing cover is easily removed to allow access to the bulb and for cleaning. The heating block is behind a protective screen and is designed to heat quickly and remains at the selected plateau temperature until the user is ready to start the test. A large LED display makes reading the temperature easy and three LEDs show the user

the state of the sample. For unknown readings the unit can be set for rapid heating (20°C per minute) to a set level and then to a slower rate of heating (2°C per minute) nearer the melting point. This unit has extendable feet, allowing the user to view samples at an optimum angle. When not in use the feet fold away to make the unit easier to store. Each unit is supplied with an individual calibration certificate showing actual temperature accuracy.

- Number of samples: 2
- Temperature range: Ambient to 300°C
- Temperature resolution: 1°C
- Temperature accuracy: $\pm 1\%$ of display temperature
- Display: Three digit LED
- Sensor: PT100
- Ramp rates: 20°C per minute to plateau, 2°C per minute to melt
- Overall Size: W160 x D220 x H170mm
- Mass: 1.8kg

Direct Delivery – up to 4 weeks

E8C14899

each **£701.95**

**A Waterproof pH Meter**

Waterproof pH meter with a casing that will float if dropped in water. Resolution with dual level LCD showing pH and temperature readings simultaneously. For convenience the pH readings can be held on the LCD using the HOLD button and the meter will automatically switch itself off to preserve battery life. Calibration is automatic (1 or 2 points) using push buttons with a choice of five buffer values. The pH electrode has a protective cap and a non-clogging fibre reference junction for long life. It can be easily replaced by the user by simply plugging in a new one.

- Temperature compensation: auto 0 to 50°C
- Battery 4 x V675HP

EBA91698

pHEP4

each **£101.95****B Checker Plus**

New low cost pocket pH tester with 0.01 resolution easy to read LCD display. Simple to use, only one button switches the unit on and allows access to the calibration procedure.

- Large LCD display
- Auto pH calibration
- Small diameter probe fits in a test tube
- Replaceable pH electrode
- Auto-off after 8 minutes
- 1000 hours battery life
- Range/Resolution - 0.00 to 14.00pH
- Accuracy - ± 0.2 pH

EBR06266each **£58.95****C pH Meter 0-14**

- Waterproof
- Display resolution: 0.1 pH
- Accuracy: ± 0.1 pH
- Interchangeable electrode
- Self calibration pH 7.00
- ATC (automatic temperature compensation)

• Delivered in box with a buffer solution pH 7.00, a soaking solution and a spare battery and multilingual instructions

EBR04357each **£87.95****D Hanna Combination Meter**

A pH/EC/TDS waterproof meter designed for simplicity in taking pH, $\mu\text{S}/\text{cm}$, ppm (mg/L) and temperature measurements. Ideal for hydroponics, greenhouses, farming and ground water applications.

Conductivity measurements are automatically compensated for temperature changes with a built-in temperature sensor. The temperature coefficient is fixed at 2%/°C. The specially engineered pH/EC/TDS and temperature probe utilises a fibre junction and gel electrolyte which provide a fast response and reduced contamination. This combination makes it particularly suitable to be used in fertilizer solutions. No probe changes are required when switching your measured parameter between pH, conductivity and TDS. These multiparameter meters reduce the number of instruments required for water quality analysis.

- Range: pH: 0.0 to 14.0 pH / EC: 0 to 1990 $\mu\text{S}/\text{cm}$ / TDS: 0 to 1990 ppm (mg/L) / Temp: 0 to 60°C
- Resolution: pH: 0.1 pH / EC: 10 $\mu\text{S}/\text{cm}$ / TDS: 10 ppm (mg/L) / Temp: 0.1°C
- Accuracy: pH: ± 0.1 pH / EC: $\pm 2\%$ F.S. / TDS: $\pm 2\%$ F.S. / Temp: $\pm 1^\circ\text{C}$
- DS Conversion Factor: 0.5 ppm (mg/L) = 1 $\mu\text{S}/\text{cm}$
- pH Calibration: manual, 1 point through offset trimmer
- EC/TDS Calibration: manual, 1 point through slope trimmer
- EC/TDS Temperature Compensation: automatic from 0 to 50°C (32 to 122°F) 2%/°C
- Probe: HI 1285-5 pH/EC/TDS/T, 1m cable (included)
- Battery Type/Life: 9VPP3/approximately 150 hours of continuous use
- Environment: 0 to 50°C (32 to 122°F), RH 100%
- Dimensions/Weight: 144.6 x 79.5 x 37mm/230g

EBR04353each **£239.95****E HALO™ Electrode**

HALO™ is the World's first professional pH probe with Bluetooth® 4.0 smart technology.

With a 10m range, HALO™ can be used outside or in the Lab, in sealed fume cupboards and can be monitored from a distance.

Can be used with free HANNA Lab app. from the Apple Store™ or with HANNA Edge Blu meter.

HANNA Lab app allows the user to calibrate and to have full GLP data, a continuous pH log and fluid graphing facility using the iPad pinch and zoom technology. Connects quickly by selecting the relevant probe from a drop down list.

Features:

- pH range/accuracy -2.000 to 16.000 / ± 0.005 pH
- mV range ± 800 mV
- Temperature range -20.0 to 120.0°C
- Calibrate with up to 5 points with seven standard buffers
- Auto temperature compensation
- Quick simple connection to iPad/Edge Blu
- Glass pH electrode for general purpose use
- GLP data
- Logging
- Fluid dynamic Graphing and Alarm feature (with HANNA Lab app)
- Works with Bluetooth® 4.0, suitable for iPad3 upwards and iPad Mini (iOS 7.1 or later).

EBR06265each **£441.95****F Hanna Piccolo 2 pH Meter**

A pocket pH meter with the accuracy of a bench meter. The Piccolo is simple to use and has a dual point calibration. The replaceable electrode has a built-in amplifier. Supplied complete with batteries, a small screwdriver for calibration and carrying case.

- Range: 1 to 13 pH
- Resolution: 0.01 pH
- Accuracy: ± 0.01 pH
- Temperature compensation: Automatic from 0 to 70°C
- Operating temperature: 0 to 50°C
- Power requirements: three 1.5V button cells (type 675H or A76)
- Length: 160mm

EBA77422each **£213.95****EBR05243**pack 5 **£959.95**



A HI-8314N pH mV and Temperature Meter

A portable pH meter with large LCD screen and Manual calibration. The plastic bodied pH electrode contains the temperature sensor making it easier to handle. Calibration is easily performed using the trimmers on the front of the instrument, with instructions shown on the screen. Readings are temperature compensated upto 70°C.

Supplied complete with pH/C probe Battery, instructions and case.

pH range: 0.00 to 14.00

pH accuracy: ± 0.01 pH

Conductivity mV: ± 1999 mV

Conductivity accuracy: ± 1 mV

Temperature range: 0.0 to 100.0°C

Temperature accuracy: ± 0.4 °C

Battery: 9V

Dimensions: 145 x 80 x 36 mm

Weight: 230g

E8R06311

each £329.95

B HI-207 Bench pH Meter

Features a built-in beaker holder, beaker-top electrode holder and rugged, two-in-one pH and temperature sensor this meter is designed to meet busy classroom environments.

It also features an extended pH range, dual-level LCD with icons for stability and buffer recognition, automatic pH calibration, and temperature display in either Celsius or Fahrenheit along with automatic temperature compensation so that all readings are automatically compensated for temperature variations.

In the classroom, these compact units reduce clutter and utilise a minimal amount of space on the desktop. Switch to battery power and the instrument can be taken outside the classroom for field studies.

pH range: -2.00 to 16.00 pH

pH accuracy: ± 0.02 pH

Temperature range: -5.0 to 105.0°C, 23.0 to 221.0°F

Temperature accuracy: ± 0.5 °C up to 60°C ± 1 °F up to 140°F ± 2 °F up to 221°F

E8R06312

each £297.95

A Salter Scales

Scales have always been an indispensable classroom apparatus and in the world of scales the undisputed heavyweight is Salter. These classic small scales, designed to be easily understood by younger children, are graduated in both imperial (up to 11lb in ounces) and metric (up to 5kg in 25g divisions), making them ideal for general, kitchen or classroom use. These dual scales are a useful aid in teaching children to cope with parallel weighing systems in use everywhere. Size closed: 200 x 150 x 110mm. Available individually or as a pack of 5.

E8R04359 each **£16.95**
E8R04360 pack 5 **£77.95**

B Salter Electronic Scale

5kg x 1g (11lb x 1/8oz) and 5 litres x 1ml (175 fl oz x 1/8 fl oz). Easy to return to zero when adding multiple ingredients. Aquatronic liquid measure. Includes 2.5 litre dishwasher, freezer and microwave safe mixing bowl with pouring spout. 13mm LCD digits for easy reading. Weigh directly onto the platform or place most containers on the scale.

E8R04269 each **£35.95**

C Weighing Scales with Body Fat Monitor

The Tanita UM-076 is perfect for monitoring changes in your weight and body composition over time. Using the latest Innerscan technology you will see the true impact of your diet and fitness programme on your body.

Features:

- Easy to use
- Stylish design
- Four data storage memories
- Advanced dual frequency technology

Measurements:

- Weight
- Body fat % (age 5-99 years)
- Healthy body fat indicator
- Total body water %
- Muscle mass in kg
- Basal metabolic rate
- Visceral fat indicator
- Guest mode
- Previous reading recall

E8R06020 each **£47.95**

D Electronic Flat Scales

Advanced technology for enhanced comfort. The extra flat dimensions make stepping onto these scales easy and comfortable. Assistance is provided by the four specially constructed load cells of stainless steel. Other reasons to admire the scales include a high-quality glass surface and extra large LCD figures.

Specification:

- Capacity: 150kg
- Graduation 1g: 100g
- Power supply: Battery
- Measure: W310 x D310 x H37mm
- Net weight: 2kg
- Functions: Auto-HOLD, Step-Off, kg/lbs/sts switch-over, Tap-on automatic switch-on, automatic switch-off

E8R06170 each **£46.95**

E Newton Platform Scales

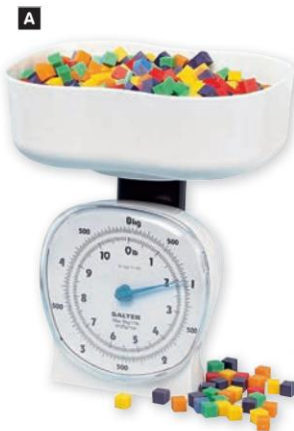
Range: 1200N x 5N. Size: 265 x 55mm.

E8A40484 each **£23.95**

F Platform Scale

Sturdy mechanical scale weighing up to 125kg. Colour may vary.

E8A51172 each **£13.95**





SPECTROPHOTOMETERS

Practical Information

- Wavelength range 330-800nm
 - Robust reliable performance at moderate cost
- A single beam instrument of excellent performance, providing coverage of the UV, visible and near infra-red spectrum.

Based on a modified Czerny Turner monochromator using a blazed holographic grating. The actual colour selected is shown alongside the wavelength scale, which is useful to the inexperienced operator. The dual cuvette holder changeover mechanism makes referencing particularly quick (immediate in the case of the digital model), and much reduces tedious cuvette handling.

Construction is to ESCHLE standards and all mains voltage components remain enclosed within an earthed metal screen even when the case is opened. The overall shape of the instrument provides maximum visibility and resists spillage. Best suited to long-term kinetics applications and is provided with a chart recorder/printer output.

Common Specification

- Wavelength range: 330 to 800nm
- Setability/accuracy: <3nm
- Bandwidth: 5nm
- Stray light at 450nm: <0.5%
- Monochromator: Blazed holographic grating

- Light Source: Prefocused tungsten lamp, 6V 1A
- Detector: Silicon photo-diode
- Cuvette holder: Dual, with changeover
- Cuvette type: 10mm square cell
- Stray light cover: Yes
- Power requirements: 220 to 240V, 50 to 60Hz, 20VA
- Dimensions: H140 x W330 x D250mm
- Mass: 3kg

A Polarimeter

For measuring the degree of rotation of plane-polarised light by solutions of optically active substances.

Mounted in a steel box with a 6V bulb in the base. Light from this source passes through a polarising filter to the sample tube. The interior of the tube support is finished in matt black to reduce internal reflections and is held in position by a pair of 4mm plugs and sockets.

The rotatable analyser is mounted in the top panel with a fixed 0-360° scale for measuring the rotation of the polarised light. The steel body has a hinged door for access to the sample tube and the illuminator unit slides out for bulb changing.

- Illumination: 6V, 0.3A tungsten
 - Sample tube: 150 x 15mm
 - Analyser scale: 0-360° - extinction at 0°, 60° and 180°
 - Dimensions: W100 x D100 x H270mm
- Supplied complete with polarisers, sample tube and instructions. For use on 6V supplies.

EBR05155

each £100.95

B WPA S1200 Spectrawave Spectrophotometer

The Spectrawave S1200 uses diode array technology to scan across the wavelength range 330-800nm. Readout is available in absorbance, % transmission, absorbance ratio and concentration. The large backlit display enables wavelength scans, kinetic assays including slope calculations and standard curves to be viewed. The instrument can store up to 99 preset measurement templates.

The instrument is delivered with Grafico, a PC utility software package, and the requisite serial lead providing the means to capture, store and print data from the instrument onto a PC. A results log can be built up or data exported to Excel. Standard 10mm pathlength glass or plastic cuvettes are accepted and the cell holder can be removed for cleaning.

- Light source: Tungsten
- Optical system: Single beam, Monochromator
- Wave length range: 330 - 800nm
- Absorbance range: -0.3 - 2.500A
- Photometric accuracy: +0.01A at 1A
- Dimensions: 215 x 270 x 120mm
- Output: RS232

CE marked and complies with relevant legislation, including EMC and low voltage directives. The S1200 comes with a one year warranty.

Direct Delivery - up to 6 weeks

EBL62443

each £2339.95

At last a Spectrometer that schools can afford.

The Data Harvest Spectrometer is a low-cost, laboratory Spectrometer with a modern design and small footprint. It is ideal as a general purpose instrument with applications in Physics, Chemistry and Biology. The use of spectrometry can be found in many walks of life from drug detection and criminal detection

It is cleverly designed to allow for the easy interchange between cuvette holder and optical fibre and can be used as both a spectrometer and a spectrophotometer. Power is derived from the USB connection, therefore no external power is required from either batteries or mains power.

Data Harvest Spectrometer

• Modular System complete with base unit and cuvette holder

- Powered by USB
- 1.2m fibre optic cable
- High Intensity White LED
- VIS and NIR spectroscopy

Applications include:

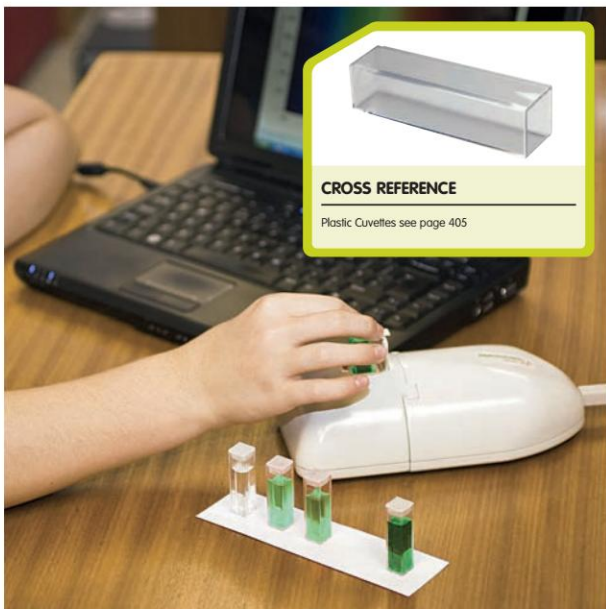
- Analysing the visual spectrum
- Beer Lamberts Law
- Plancks constant - determination of wavelength
- Absorbance spectrum of a liquid
- White Light; forensic science

Specifications:

- Calibrated spectrum range 400nm to 750nm
- Resolution 1.5nm
- Accuracy $\pm 3\text{nm}$
- Integration Time 9ms to 3s (adjustable)
- Dynamic Range 12bit

E8R03183

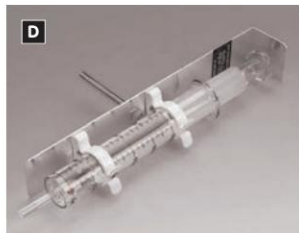
each £515.95



CROSS REFERENCE

Plastic Cuvettes see page 405





CROSS REFERENCE

Gas Syringe see page 146
Beakers see page 433

A Syringe, Disposable Sterile

Translucent plastic barrel graduated in cm³ with a Luer fitting. NOT for paraaldehyde. Supplied WITHOUT needle.

E8B93215	1mL	pack 100 £19.95
E8B93239	5mL	pack 100 £13.95
E8B93240	10mL	pack 100 £22.95

B Syringe, Disposable

Plastic syringe. Capacity 100mL. Graduated every 2cm³. Disposable.

E8A84384

each £5.99

C Three-Way Tap for Syringe

The tap has two female and one male Luer connectors and is designed so that two connectors are in communication at any given position of the valve lever.

Direct Delivery - up to 8 weeks

E8A84517

pack 5 £16.95

D Holder for 100mL Syringe

Two plastic coated clips on a metal plate turned up at one end to form a stop for the plunger, enabling the 100mL position to be set. Holder also provided with rod for mounting in ordinary retort-stand boss.

Supplied without syringe.
Dimensions: L320 x W50 x H153mm.

E8A84402

each £33.95

A Red Spirit Filled Thermometer - Total Immersion

General purpose spirit thermometers. White enamelled back with reinforced bulbs. Supplied with non-roll fitting. Diameter: 6.5mm.

	Range, °C	Grad, °C	Length	
E8L73994	-10/50	0.5	305mm	each £3.59
E8A86149	-10/110	1	155mm	each £2.49
E8A86150	-10/110	1	205mm	each £2.89
E8R01906	-10/110	1	155mm	pack 10 £23.95

B Red Spirit Filled Thermometer - Partial Immersion

General purpose spirit thermometers. White enamelled back with reinforced bulbs. Supplied with non-roll fitting. Diameter: 6.5mm. Immersion is 76mm.

	Range, °C	Grad, °C	Length	
E8A86162	-10/50	0.5	305mm	each £3.19
E8A86186	-10/110	1	305mm	each £2.79
E8A86198	-10/150	1	305mm	each £2.79
E8R01905	-10/110	1	305mm	pack 10 £17.95

C Blue Spirit Filled Thermometer - Total Immersion

General purpose spirit filled thermometer. White enamelled back with reinforced bulbs. Supplied with non-roll fitting. Diameter: 6.5mm. Immersion is 76mm.

	Range, °C	Grad, °C	Length	
E8A86228	-10/110	1	155mm	each £3.09
E8L74019	-10/110	1	305mm	each £3.59
E8L74007	-10/200	1	305mm	each £4.19

D Blue Spirit Filled Thermometer - Partial Immersion

General purpose spirit thermometers. White enamelled back with reinforced bulbs. Supplied with non-roll fitting. Diameter: 6.5mm. Immersion is 76mm.

	Range, °C	Grad, °C	Length	
E8A86239	-10/110	1	305mm	each £3.29

E Graduated Thermometer - Total Immersion

This is a total immersion thermometer, 100mm in length available with either 0.1 or 0.2 degree graduations.

	Grad, °C	Length	
E8R05517	0.1	100mm	each £12.95
E8R05519	0.2	100mm	each £12.95

Graduated Thermometer - Partial Immersion

This is a partial immersion thermometer, 100mm in length available with either 0.1 or 0.2 degree graduations.

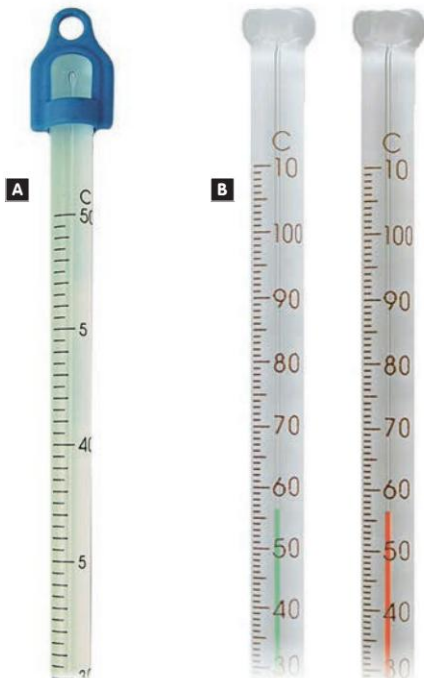
	Grad, °C	Length	
E8R05516	0.1	100mm	each £12.95
E8R05518	0.2	405mm	each £12.95

Practical Information

- Immersion depth: thermometers available are total or partial immersion. Total immersion thermometers are designed to give correct readings when completely immersed in the medium under test. Partial immersion thermometers are calibrated to read correctly when immersed to defined depth (usually 76mm).
- Faults during transit: thermometers may develop faults during transit or when otherwise subject to undue vibration. Most faults can be corrected by following the suggestions.
- Gas trapped in bulb: tap any bubbles of gas into the top of the bulb then cool the bulb in a suitably cold medium. As the spirit contracts the trapped gas should be forced above the spirit.
- Broken thread: the spirit thread may be rejoined by cooling.
- Detached spirit at the top of contraction chamber: cool the bulb until spirit comes down into the contraction chamber. The side of the stem should be gently tapped until the detached mercury forms a globule on the wall of the contraction chamber. By gently heating the bulb this spirit can be rejoined to the main column.
- Detached spirit in the expansion chamber: tap the top of the stem until the detached spirit collects at the top of the capillary. Very carefully heat the thermometer. As the expanding spirit forces gas into the expansion chamber, continue to tap the stem in order to keep the detached spirit on top of the capillary.
- Maximum/minimum thermometers: for broken threads, hold at the top and give a sharp shake.

A**B****C****D****E**

Brannan



A Low Toxicity Thermometers - Partial Immersion

Laboratory thermometers with a low toxicity filling and clear permanent markings. Supplied with a non-roll top which has a safety suspension ring. Diameter: 6.5mm.

	Range, °C	Grad, °C	Length	each
E8A86265	-20/110	1	305mm	£2.99
E8R03145	-10/210	1	405mm	£4.49
E8R03146	-10/260	1	405mm	£6.69

Practical Information

LOW TOXICITY THERMOMETERS - PARTIAL IMMERSION

LO-tox is an Organic filling specially chosen to achieve a wide temperature span whilst providing the lowest practical levels of hazard. The quality and legibility make these an ideal substitute for Mercury Thermometers. Filled with Brannan non roll end cap which has a ring to allow the thermometers to be suspended.

B 'Initial' Lab Thermometer

UK manufactured economy range of laboratory thermometers. Robust with reinforced bulb. Green spirit filled. Available in 3 lengths. Graduated versions: -10 to 110°C. Pack of 5.

	Length	pack 5
E8R05777	150mm	£7.19
E8R05776	200mm	£7.19
E8R05778	300mm	£8.09

Thermometer, Ungraduated

Ungraduated thermometer, range approximately -15 to 115°C. The instruments are left blank to allow students to create their own scale. Filled with red spirit. Diameter: 6.5mm. Length: 247mm.

E8A86393 each £4.39

C Pocket Test Thermometers, Spirit

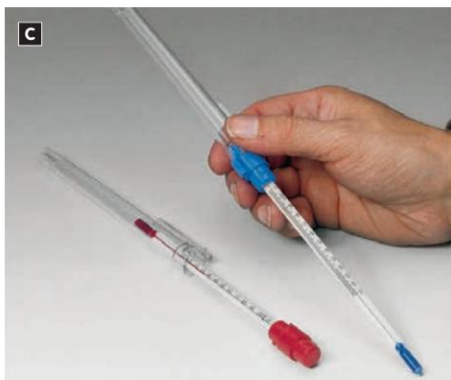
15mm glass thermometers in a clear pocket case. The case can be used as a handle. Available in blue or red spirit. Range -10 to 110°C.

E8A86204	Blue	each £5.39
E8A86216	Red	each £5.39

D Greenfill Thermometers Classroom Pack

A pack of 16 green spirit filled thermometers with a temperature range of -10°C to 110°C in a sturdy storage box. Contains 8 x 150mm stirring thermometers, 7 x 300mm stirring thermometers, 1 x 300mm ungraduated thermometer, 1 x teachers notes and worksheet booklet (photocopiable).

E8A37564 pack £51.95

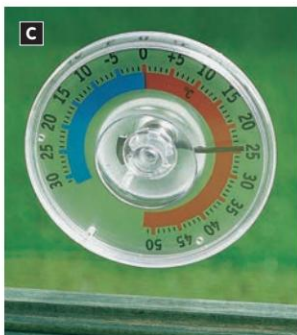


A**A Giant Thermometer**

Its large scale is easily read and the alcohol filled column is set into the case. (-30°C to +50°C). Size: W130 x D76 x H380mm.

E8R05779each **£21.95****B****B Forehead Thermometer Strip**

Liquid crystal thermometer strip which indicates body temperature when placed on the forehead. Range: +35 to +40°C

E8G60139pack 10 **£13.95****C****D****C Window Thermometer**

Round window thermometer with suction attachment at the centre. The design allows air circulation around the thermometer stopping exaggerated readings that may be caused by heat radiation through the glass. Will stand up to 20mm from window.

- Range: -20 to 50°C
- Diameter: 80mm

E8F82311each **£4.39****D Wall Thermometer**

Distinctive moulding in a very large clear print that is easily read. Graduated -20 to 50°C and 0 to 120°F. Size: H215 x W38 x D8mm.

E8R05780each **£2.79****E****E Digital Clinical Thermometer**

Features small physical size and low mass, and the LCD digital display provides a rapid, unambiguous readout. An audible tone indicates completion of the measuring period and automatic switch-off takes place after ten minutes to conserve battery life.

- Measurement range: 32.0 to 43.0°C
- Accuracy: $\pm 0.1^\circ\text{C}$
- Sensor: Thermistor
- Readout: three digit LCD with indication of out-of-range high or low temperature and low battery
- Sampling rate: two per second
- Power source: Silver oxide cell type SR41W or equivalent giving 200 hours life (three years of normal use approx)
- Power switch: Manual on/off button
- Automatic switch-off: ten minutes after last indication
- Dimensions: L130 x W18 x H9mm overall
- Probe tip diameter: 3mm
- Mass: 7g

Supplied fitted with silver oxide cell SR41W.

E8A86654each **£5.49****F****F Thermometers Pack**

Pack of 10 spirit filled thermometers, each 150mm long.

E8R05775pack **£22.95**



A Hand Held Digital Thermometer

Digital thermometer with stainless steel probe, range -50 to +200°C/-58 to +392°F, resolution 0.1°C, max/min and data hold options. Requires 1 x 1.5V AAA battery. Stand clip and magnet on the back of the case.

Dimensions: 195 x W65 x D20mm, cable 1.5m, stainless steel probe 120mm, handle 95mm.

E8L75747

each £28.95

B Waterproof Digital Thermometer

A waterproof pocket probe thermometer for measuring the temperature of liquids and soft solids, with max/min options;

- Range: -50°C to +150°C
- Display resolution: 0.1°C
- Battery: 1 x 393A cell battery
- Stainless steel piercing probe: 125mm
- Overall length: 205mm with case in position

E8L75723

each £12.95

C Pocket Infrared Thermometer

A quick and easy infrared thermometer providing safe temperature measurement where non contact access is required. Supplied complete with wrist strap, clip out stamp and storage pouch. Range: -35 to +230°C&F. Dimension: 75 x 40 x 20mm. LCD Dimensions: 13 x 25mm.

E8R02933

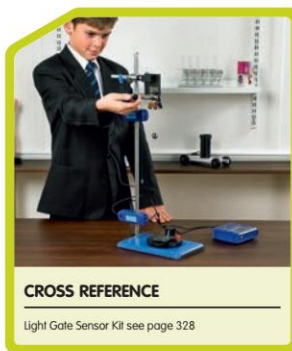
each £35.95

D Thermometer with Probe

Water resistant probe thermometer, 110mm length probe, range -10 to +200 degrees Celsius, resolutions in 0.1 degrees Celsius, supplied with protective cover. Switchable between degrees C and F. Includes 1 x LR44 button cell.

E8R06005

each £12.95

**A Fastime 01 Stopwatch**

Set of 6 colours, 24-hour stopwatch, time/calendar display and alarm. Battery included.

E8R06358

set 6 **£28.95**

B dsx School Stopwatch

24-hour stopwatch with time/calendar display and alarm. Takes cumulative split times with time out and 1-2 last finish. Shock resistant. Black.

E8R05917

each **£5.59**

E8R01743

pack 10 **£47.95**

C LCD Stopwatch

1/100 second LCD stopwatch with lap facility, normal time, alarm and calendar. Counts up to 40 minutes in 1/100 second and then to 24 hours in 1 second intervals. 8mm and 6mm digit heights. 3 volt operating system with 2032 lithium battery, offering increased reliability and accuracy. 5 year battery life under normal use, accuracy within 1 second over 24 hours. Silver water resistant case 64x58mm with cord lanyard.

E8R06068

each **£8.79**

D Single Event Timer

A single event timer which is extremely easy to use, with a simple start, stop and reset operation. An audible beep confirms any operation. 1/100 second resolution to ten hours.

E8R01745

each **£16.95**

E Pupil Sand Timers

Let your pupils see time passing with this fantastic value set of 20 pupil sand timers in a durable plastic carry case with handles.

E8R05265

pack **£31.95**

CROSS REFERENCE

Light Gate Sensor Kit see page 328



A Bench Timer

The Brannan bench top timers are easy to use and are particularly suited for use in schools. They have colour coded buttons and a clear LCD display, housed in a robust ABS casing. The timers are highly accurate, have count up with lap and split timing features. Timing period up to 9 hours, 59 minutes and 59 seconds. Supplied complete with fully operating instructions and batteries. Dimensions: 100 x 90 x 70.5mm. LCD Dimensions 63.7 x 19.7mm.

EBR03149

each £17.95

B Bench Timer with External Triggering Contacts

As above with external triggering contacts.

EBR03150

each £18.95

C Bench Stopwatch

A simple easy to use 1/100 second stopclock counting up to 24 hours with lap facility, clock with calendar and alarm. While case with three button operation consisting of mode, split/lap/reset, and start/stop. Size: L120 x W100 x H45mm.

EBA91510

each £21.95

D Economy Analogue Stop Clock

This budget timer times up to 60 minutes in seconds. Has stop, start and zero controls. Removable winder and cover.

EBE47201

each £14.95

E Time Tracker

This fun to use timer has several alarms, allowing multiple timers to be set. Simply program the required time periods and press the top to see it count up or down – great for competitive teamwork or timing experiments. Requires 4 x AA batteries (not included).

EBR06267

each £30.95



Exclusive

UNILAB®

Spares
and
Accessories**Centi-Second Timer Module**

Allows accurate, triggered timing on the order of centi-seconds.

EBH27749

each £44.95

Button Cell

Silver oxide button cell type LR44.

EBR00295

each £2.39

A Unilab Motion QED

Motion QED is a popular self-contained unit designed to store and calculate times, speeds and accelerations.

Specification:

Event Timer: From 2 to 8 readings, timing each event.

Interval Timing: From 1 to 4 readings: up to 4 successive obstructions on any combination of the four inputs can be measured and displayed.

Speed: From 1 to 4 readings: speeds (in meters per second, display shows m/s) are calculated and displayed for mask lengths of 1 to 10cm (in 1cm steps) or from 10 to 200cm (in 10cm steps).

Gap Timer: From 1 to 3 readings: similar to Interval Timing with only the leading edge of an obstruction being recognised so that times between gates are recorded and displayed.

Average Speed: 1 reading: based on the Gap Timing Mode above, this program calculates and displays an average speed (in m/s) between gates which are from 10 to 200cm apart (in 10cm steps).

Acceleration: 1 or 2 readings: for a vehicle carrying a single or double mask of known length passing through successive gates, the acceleration is calculated and displayed (as m/s/s).

A useful feature of Motion QED is the ability to measure times which students then use to calculate speeds or accelerations. Once the theoretical groundwork has been done, the unit can be used to perform the calculations directly, allowing students to concentrate on the physics.

Technical Details:

Inputs: 4 TTL inputs protected against misconnection up to 20V a.c. or d.c.; 4mm sockets with 1 "Manual" push-button. Outputs: 12V to power external devices such as light gates; 4mm sockets

Power: 12 to 16V a.c. or d.c. from a low voltage power supply.

Protection: two internal 500mA anti-surge fuses.

Timing: times to ± 1 ms.

Mass: 0.9kg.

Size: 240 x 135 x 45mm.

EBH28020

each £359.95

B Unilab Digital Stopclock

• Large 12mm high display

• Timing features include start/stop and reset via the top-mounted push switches or via the front panel 4mm sockets

The stopclock can time up to 1 hour in 1/100 second with split (lap) timing if required. It is powered by two AA/R6 or HP7 cells which give many months of use. If light gates are to be used, the Centi-Second Timer Module provides extra facilities.

Please note this product is not supplied with a battery.

EBH27507

each £52.95

CHOOSING A BALANCE

1. Where is the balance going to be used?

Indoors or out? Does it need to be battery and mains powered? Most dual powered balances are easily portable.

2. What is the maximum capacity required?

Assess the needs of everyone that will be using the balance so that you do not purchase a balance that will only have limited use.

3. What resolution do you really need?

Please note more decimal places usually means greater cost and lower capacity.

4. Do you require additional features?

Newtons, underbalance weighing, animal weighing. Just a few of the useful extras available.

5. What weighing pan size/shape is required?

What is the balance to be used for? What size/shape objects will the pan need to accommodate?

6. Will the balance need to be used with a computer?

RS232 ports are standard on most balances.

Helpful Hint

1. Modern balances are less prone to "waver", but always place your balance on the firmest surface available. If the balance is being used in a preparation room make sure the dishwasher is not in use – you would be amazed what this can do to your readings!

2. Position the balance as far from draughts as possible. Keep windows firmly shut for best results even if your balance has a draught shield.

3. Try to choose a balance that will suit most people's needs and then you will be sure to get maximum use and value for money.

Capacity	Readability	Brand	Specification	Model Number	Our Code	Page	Price
65g	0.001g	Ohaus	Pioneer™ Analytical and Precision Balances	PA64	E8R01448	430	£791.95
120g	0.001g	Adam	Highland™ Portable Precision Balances	HCB123	E8R03218	429	£308.95
200g	0.1g	Adam	Dune School Balance	DCT201	E8R04190	425	£48.95
200g	0.1g	Ohaus	Ohaus CL 201	CL201	E8R05209	426	£36.95
200g	0.1g	Ohaus	Ohaus CS	CS200	E8R01435	427	£50.95
200g	0.01g	Adam	Core™ Compact Portable Balances	CQT202	E8R03215	429	£179.95
220g	0.01g	Ohaus	Scout® Series	SKX222	E8R06332	430	£251.95
250g	0.1g	Adam	Core™ Compact Portable Balances	CQT251	E8R03214	429	£106.95
300g	0.01g	Ohaus	Traveler™	TA302	E8R01439	428	£210.95
410g	0.1g	Ohaus	Pioneer™ Analytical and Precision Balances	PA413	E8R01452	430	£624.95
420g	0.01g	Ohaus	Scout® Series	SKX422	E8R06331	430	£299.95
500g	0.1g	Adam	Adam CB501	CB501	E8R05213	425	£39.95
500g	0.1g	Ohaus	Ohaus CL501	CL501	E8R05210	426	£44.95
500g	1g	Ohaus	Traveler™	TA501	E8R01441	428	£134.95
500g	0.01g	Ohaus	Traveler™	TA502	E8R05212	428	£611.95
600g	0.1g	Adam	Core™ Compact Portable Balances	CQT601	E8R03216	429	£122.95
600g	0.01g	Adam	Highland™ Portable Precision Balances	HBC602H	E8R03220	429	£291.95
620g	0.01g	MK	Lab 622	Lab 622	E8R05511	426	£112.95
620g	0.1g	Ohaus	Scout® Series	SKX621	E8R06329	430	£195.95
620g	0.01g	Ohaus	Scout® Series	SKX622	E8R06330	430	£335.95
1000g	0.1g	Adam	Adam CB1001	CB1001	E8R05214	425	£51.95
1000g	0.01g	Adam	Highland™ Portable Precision Balances	HCB1002	E8R03221	429	£324.95
1500g	0.1g	Adam	Core™ Compact Portable Balances	CQT1501	E8R03217	429	£150.95
2000g	1.0g	Ohaus	Ohaus CL2000	CL2000	E8R05211	426	£31.95
2000g	1.0g	Ohaus	Ohaus CS	CS2000	E8R01436	427	£50.95
2100g	0.01g	Ohaus	Pioneer™ Analytical and Precision Balances	PA21202	E8R01454	430	£603.95
2200g	0.01g	Ohaus	Scout® Series	SKX2201	E8R06327	430	£256.95
3000g	1.0g	Adam	Adam CB3000	CB300	E8R05215	425	£37.95
3000g	0.1g	Ohaus	Traveler™	TA3001	E8R01443	428	£212.95
5000g	1.0g	Ohaus	Traveler™	TA5000	E8R01444	428	£148.95
6200g	0.1g	Ohaus	Scout® Series	SKX6201	E8R06328	430	£347.95



For more than 100 years, OHAUS has been the brand of choice for customers looking for high quality, full-featured scales and balances. We have selected from their range to bring you the best quality choice for your establishment.



Adam seeks to create intuitive balances and scales that are easy to operate and that offer smart, useful features to help boost efficiency and productivity. We have selected from their range to bring you the best choice for your budget.

Dune School Balance

- 3 weighing units (g, lb, oz)
- Full range tare
- Zero tracking
- Large easy to read LCD display
- Overload protection
- Colour coded, sealed keypad
- Lightweight and portable
- Simple user-friendly operation
- Precision load cell technology
- Splashproof to protect from accidental spills
- External calibration
- Low battery indication
- Auto sleep/power down function to save battery life
- Use either 6 AA batteries (not included) or the AC adapter supplied

Economy
Science

SPECIFICATION	
CODE	E8R04190
Capacity	200g
Readability	0.1g
Repeatability	0.1g
Linearity	±0.2g
Weighing Units	g, oz, lb
Stabilisation Time	3 secs
Pan size	145 x 145mm
PACK SIZE	each
PRICE	£48.95

**Adam Compact Balances**

- 3 weighing units (g, lb, oz)
- A compact portable scale which is ideally suited for a variety of uses and applications
- Small and easy to use
- Bright green, backlit LCD display shows clear results
- Simple to use keyboard
- Grade 304 stainless steel removable top pan for easy cleaning
- Batteries included
- Optional power adaptor available



SPECIFICATION			
CODE	E8R05213	E8R05214	E8R05215
Capacity	500g	1000g	3000g
Readability	0.1g	0.1g	1g
Repeatability	0.1g	0.1g	1g
Linearity	0.1g	0.1g	1g
Weighing Units	g, oz, lb	g, oz, lb	g, oz, lb
Stabilisation Time	2 secs	2 secs	2 secs
Pan size	130mm	130mm	130mm
PACK SIZE	each	each	each
PRICE	£39.95	£51.95	£37.95



Direct
Delivery

Economy
Science



Everyday
Science

The high precision, low cost MKL portable balance is designed to be easy to use with intuitive functions. The balance has a large backlit display, a modern compact design with built-in spirit level and levelling feet.

Balance MK LAB 622

- 3 weighing units (g, oz, Newtons)
- Can be stacked for storage and transportation
- Dual tare keys
- Overload protection
- ABS case with adjustable feet
- Auto power off
- Parts Counting
- Lock down mounting slot
- Capacity Tracker
- % Weighing
- Mains power adapter with optional AA batteries

Direct Delivery - up to 7 days

SPECIFICATION

CODE	E8R05511
Capacity	620g
Readability	0.01g
Repeatability	+/- 0.02g
Linearity	+/- 0.03g
Weighing Units	grams, ounces and Newtons
Stabilisation Time	2 seconds
Pan size	120mm
PACK SIZE	each
PRICE	£112.95

Our Ohaus CL Compact balances are lightweight and portable, perfectly suited for use in education. Applications can include quality control, formulation, soil sampling and dietary weighing.

Ohaus CL Balances

- 4 weighing units (g, lb-oz, oz, dwl)
- Compact, stackable design for easy storage
- Large, easy to read LCD display
- Integrated load cell lock
- Auto sleep/power down function to save battery life
- Batteries included

SPECIFICATION

CODE	E8R05209	E8R05210	E8R05211
Capacity	200g	500g	2000g
Readability	0.1g	0.1g	1.0g
Repeatability	0.1g	0.1g	1.0g
Linearity	±0.1g	±0.1g	±1.0g
Weighing Units	g, lb-oz, oz, dwl	g, lb-oz, oz, dwl	g, lb-oz, oz, dwl
Stabilisation Time	3 secs	3 secs	3 secs
Pan size	120mm	120mm	120mm
PACK SIZE	each	each	each
PRICE	£36.95	£44.95	£31.95



Great Value

SAVE
When you
buy pack 5
(E8R02341)

Ohaus Compact Scales are ideal when cost matters and dependable results are a must. These scales have a wide variety of applications, more than any other scale in their class. The two portable models range in capacities from 200g to 2000g, and are perfect for use in light production, in the field, the kitchen, the office, and more. Easy operation, long battery life, and great performance make the CS truly remarkable value.

CS Series

- 3 weighing units (g, lb, oz)
- Sleek, low profile design with large stainless steel pan
- Large, high contrast LCD display
- Auto sleep/power down function to save battery life
- Use either 3 AA batteries or the AC adapter (both supplied)

SPECIFICATION

CODE	E8R01435	E8R02341	E8R01436
Capacity	200g		2000g
Readability	0.1g		1.0g
Repeatability	0.1g		1.0g
Linearity	±1.0g		±1.0g
Weighing Units	g, lb, oz		g, lb, oz
Stabilisation Time	3 secs		3 secs
Pan size	145 x 133mm		145 x 133mm
PACK SIZE	each	pack 5	each
PRICE	£50.95	£246.95	£50.95



The Traveler™ Series was designed for basic routine weighing in education applications. With its unique draftshield that offers weigh-thru capability while being used and 'stackability' when being stored, USB or RS232 interface options for versatility in data transfer and a host of other features, Traveler offer great value for education.

Traveler™

Unique Weigh-thru draftshield designed with an easy to remove centre piece that provides protection from rough environments while maintaining weighing speed, designed to stack, shipping lock, calibration lock, fixed integral weigh below hook. The draftshield's centre piece can also be removed and converts into a weigh boat when turned upside down.

• USB or RS232 Connectivity

Traveler was designed with easy-to-install interface options, which provide weight output to an OHAUS printer or PC.

• Transportation lock to protect the balance's weighing cell during transportation

• Calibration lock to avoid accidental changing of settings

SPECIFICATION

CODE	E8R01439	E8R05212	E8R01441	E8R01443	E8R01444
Capacity	300g	500g	500g	3000g	5000g
Readability	0.01g	0.01g	0.1g	0.1g	1.0g
Repeatability	0.01g	0.01g	0.1g	0.1g	1.0g
Linearity	±0.01g	±1d	±1.0g	±1.0g	±1.0g
Weighing Units	g, n	g, n	g, n	g, n	g, n
Stabilisation Time	3 sec	3 secs	3 secs	3 secs	3 secs
Pan size	120mm	120 x 135mm	120 x 135mm	120 x 135mm	120 x 135mm
PACK SIZE	each	each	each	each	each
PRICE	£210.95	£611.95	£134.95	£212.95	£148.95

Core™ Compact Portable Balances



Direct Delivery – up to 7 days

SPECIFICATION

CODE	E8R03215	E8R03214	E8R03216	E8R03217
Capacity	200g	250g	600g	1500g
Readability	0.01g	0.1g	0.1g	0.1g
Repeatability	0.01g	0.1g	0.1g	0.1g
Linearity	±0.02g	±0.01g	±0.01g	±0.2g
Weighing Units	kg, g, lb, oz, n	kg, g, lb, oz, n	kg, g, lb, oz, n	kg, g, lb, oz, n
Stabilisation Time	3 secs	3 secs	2 secs	2 secs
Pan size	120mm	120mm	120mm	120mm
PACK SIZE	each	each	each	each
PRICE	£179.95	£106.95	£122.95	£150.95

Highland™ Portable Precision Balances



Direct Delivery – up to 7 days

SPECIFICATION

CODE	E8R03218	E8R03220	E8R03221
Capacity	120g	600g	1000g
Readability	0.001g	0.01g	0.01g
Repeatability	0.003g	0.02g	0.02g
Linearity	±0.003g	±0.02g	±0.02g
Weighing Units	kg, g, mg, lb, oz, n	kg, g, ct, lb, oz, n	kg, g, ct, lb, oz, n
Stabilisation Time	2 secs	2 secs	2 secs
Pan size	120mm	120mm	120mm
PACK SIZE	each	each	each
PRICE	£308.95	£291.95	£324.95

Scout® Series



Now Bluetooth Enabled

SPECIFICATION

CODE	E8R06332	E8R06331	E8R06330	E8R06329	E8R06327	E8R06328
Capacity	220g	420g	620g	620g	2200g	6200g
Readability	0.01g	0.01g	0.01g	0.1g	0.1g	0.1g
Repeatability	0.01g	0.01g	0.01g	0.1g	0.1g	0.1g
Linearity	0.01g	0.01g	0.02g	0.1g	0.1g	0.2g
Weighing Units	mg, g, kg, ct, N, oz, ozt, dwt, lb, lb-oz, gm, hkt, sgt, twt, tical, tola, Customer unit 1					
Stabilisation Time	1 secs	1 secs	1 secs	1 secs	1 secs	1 secs
Pan size	Ø120mm		170 x 140 mm			
PACK SIZE	each	each	each	each	each	each
PRICE	£251.95	£299.95	£335.95	£195.95	£256.95	£347.95

Pioneer™ Analytical and Precision Balances



SPECIFICATION

CODE	E8R01448	E8R01452	E8R01454
Capacity	65g	410g	2100g
Readability	0.0001g	0.001g	0.01g
Repeatability	0.0001g	0.001g	0.01g
Linearity	±0.0002g	±0.002g	±0.2g
Weighing Units	g, mg, ct, oz, dwt	g, mg, ct, oz, dwt	kg, g, lb, oz
Stabilisation Time	3 secs	3 secs	3 sec
Pan size	90mm	120mm	180mm
PACK SIZE	each	each	each
PRICE	£791.95	£624.95	£603.95

A Ohaus Triple Beam Mechanical Balance

The Ohaus Triple Beam is a versatile balance that will take on a wide variety of weighing tasks and is designed to stay accurate with everyday use. The Triple Beam was designed by OHAUS with cost in mind and is manufactured to meet our stringent standards of quality and performance. The patented design includes notched and tiered beams for easy reading, magnetic dampening for quick results and zero adjust compensator ensures correct zero. 610g x 0.1g standard capacity and readability. Security features: the Triple Beam comes with two lockable connections on the back for the product for locking to a table or other fixed object. One connection allows the use of a computer laptop cable. The second connection allows the use of any cable that can be looped through the back.

E8R01459

each £167.95



B Weighing Boats

Disposable polystyrene weighing boat. Pack of 250. Size: 80 x 60mm, capacity: 30cm³.

E8R04950

pack 250 £25.95



C Calibration Weights

This 1g - 500g set includes the following weights: 1g, 2 x 2g, 5g, 10g, 2 x 20g, 50g, 100g, 2 x 200g and 500g - 12 weights in total.

Direct Delivery - up to 7 days

E8R05774

pack 12 £17.95



D Salter Electronic Scale

Electronic scale that weighs 5kg x 1g and 11lb x 1/8 oz and 5 litres x 1ml and 175fl oz x 1/8 fl oz. Includes plastic mixing bowl with spout. Can weigh directly 0 to the platform or place most containers on the scale. 13mm LCD digits for easy reading.

E8R04269

each £35.95

E Salter Scale

Easy to store, this versatile scale fits inside its bowl for neat storage. The clock face style features large, easy read digits. 2 litre, dishwasher safe weighing bowl. Weighs 5kg x 25g and 11lb x 1oz.

E8R04268

each £16.95



Helpful Hint

CALIBRATION

The balances are calibrated prior to shipping and we highly recommend that they are calibrated again when received. The effects of both transportation and changes in temperature can have an impact on the balance accuracy. Please contact Philip Harris Technical Support for advice on how to conduct the calibration.

Direct Delivery

Economy Science

WHATEVER YOUR BUDGET, WE HAVE THE PERFECT GLASSWARE FOR YOU!

Economy Science

Our Economy Science range is made from Borosilicate 3.3 glass and complies with ISO standards.

It is designed for general laboratory use and represents extremely good value.

We have featured a choice of brands in our Economy range to ensure that you have the best, whatever your budget.

Everyday Science

We have three brands in our Everyday Science range to ensure that you have the best options for your budget. These brands enable you to perform all of your lab work without paying the highest prices for your glassware.

SIMAX®
BOROSILICATE GLASS 3.3

Simax borosilicate glass 3.3 has excellent thermal properties because of its high softening point and low coefficient of expansion. It is considered highly heat resistant.

KIMBLE CHASE

Kimble's borosilicate glass meets the specification of ISO 3585, type 3.3, ASTM E-438, type 1 class A. It has a low coefficient of expansion and a very high resistance to chemical attack.

Azlon

Azlon Polypropylene PP is typically used for beakers, bottles and cylinders made from a translucent rigid polymer. Suitable for use between -20°C to +135°C, autoclavable to 121°C, this material has good to excellent chemical resistance and is tough enough to resist fatigue.

Exceptional Science

Our Exceptional Science range offers you a premium brand that you can trust for, safety, accuracy, quality and longevity. Made from Borosilicate 3.3 glass and complying with ISO standards, our exceptional range features the recognised brands synonymous with high quality teaching resources.

PYREX®

Always a best seller, Pyrex® borosilicate glass meets the specifications of the following standards ISO 3585, DIN 12217 - Type 3.3. Due to the demanding conditions that borosilicate glass is subjected to, maximum chemical toughness, minimum thermal expansion and high resistance to thermal shock make Pyrex® the ideal material for use in any laboratory.

A

Economy
ScienceGreat
Value

B

SIMAX®
BOROSILICATE GLASS 3.3
Economy
ScienceGreat
Value**A Economy Beakers, Squat Form with Spout**

Squat form, graduated beaker with spout. Borosilicate glass. Conforms to ISO 3819.

Capacity	
E8F65647	50ml
E8F65659	100ml
E8F65660	250ml
E8F65672	400ml
E8F65684	600ml
E8F65696	800ml
E8R04390	1000ml

pack 12	£8.99
pack 12	£10.95
pack 12	£11.95
pack 12	£12.95
pack 6	£9.89
pack 6	£12.95
pack 6	£13.95

B Simax® Beakers, Squat Form with Spout

Simax® borosilicate glass, squat form, graduated beaker with spout. Conforms to ISO 3819.

Capacity	
E8R04386	25ml
E8L10935	50ml
E8L10947	100ml
E8R06112	100ml
E8R04387	150ml
E8R06113	250ml
E8L10959	250ml
E8L10960	400ml
E8L10972	600ml
E8R04388	800ml
E8R05812	1000ml
E8A54367	2000ml

pack 10	£10.95
pack 10	£11.95
pack 10	£9.95
pack 100	£101.95
pack 10	£13.95
pack 100	£115.95
pack 10	£11.95
pack 10	£16.95
pack 10	£20.95
pack 10	£31.95
pack 10	£34.95
each	£7.19

A

**A Kimble Glass**

Squat form, Kimble ValueWare® beaker. Conforms to ISO 3819.

	Capacity	
E8R04391	25mL	pack 10 £21.95
E8R01992	50mL	pack 10 £21.95
E8R01991	100mL	pack 10 £22.95
E8R04392	150mL	pack 10 £23.95
E8R01990	250mL	pack 10 £24.95
E8R01993	400mL	pack 10 £27.95
E8R04393	600mL	pack 10 £30.95
E8R04394	1000mL	each £7.59

B Pyrex® Glass Beaker

Squat form, Pyrex® beaker made from borosilicate glass. White enamel graduations and marking patch. Conforms to ISO 3585.

	Capacity	
E8R04395	25mL	pack 10 £29.95
E8L10509	50mL	pack 10 £33.95
E8L10546	100mL	pack 10 £35.95
E8L10558	150mL	pack 10 £38.95
E8L10569	250mL	pack 10 £37.95
E8L10571	400mL	pack 10 £47.95
E8L10583	600mL	pack 10 £55.95
E8R04397	800mL	pack 10 £77.95
E8R05813	1000mL	pack 10 £91.95
E8A54501	2000mL	each £16.95

C Pyrex® Heavy Duty Glass Beaker

Heavy duty, low form beaker. Reinforced rims and spout, thicker walls and heavier bases. Mechanically stronger than standard beakers, designed for longer life. Conforms to ISO 3585.

	Capacity	
E8R05814	150mL	pack 12 £73.95
E8R05815	400mL	pack 12 £102.95
E8R05816	1000mL	pack 6 £85.95
E8R05817	2000mL	pack 4 £107.95

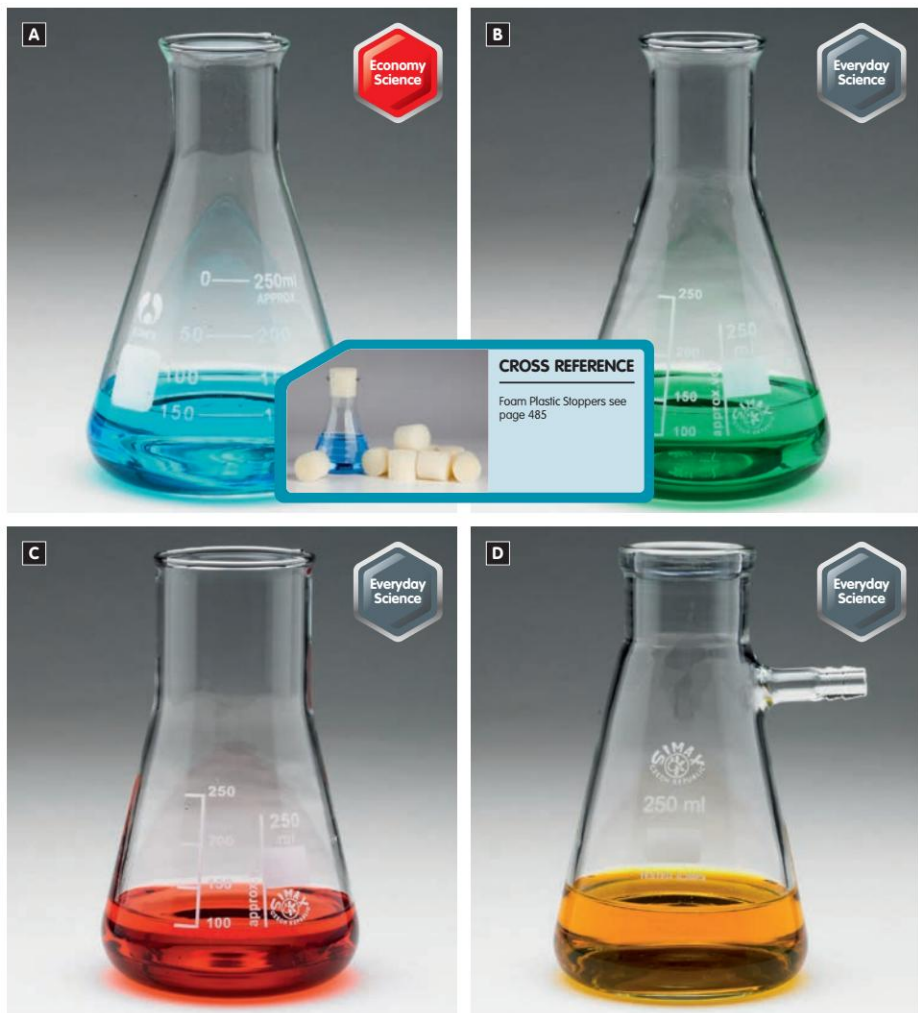
B PYREX®**C PYREX®**



SIMAX®

TRADITIONAL EUROPEAN PRODUCER SINCE 1837

- Company - ISO Accredited
- Borosilicate glass 3.3 ISO 3585
- High quality at economical prices
- Laboratory and technical glass
- Simax measures up in all respects - quality, price, delivery and customer satisfaction

**A Economy, Narrow Mouth, Conical Flasks**

White enamel graduations, borosilicate glass.

Capacity	
50mL	pack 24 £23.95
100mL	pack 12 £12.95
250mL	pack 6 £7.59
500mL	pack 6 £9.79
1000mL	pack 6 £18.95

B Simax®, Narrow Mouth, Conical Flasks

White enamel graduations, borosilicate glass.

Capacity	
50mL	pack 10 £35.95
100mL	pack 10 £16.95
250mL	pack 10 £18.95
500mL	pack 10 £179.95
1000mL	pack 10 £29.95
	each £4.79

C Simax®, Wide Mouth, Conical Flasks

White enamel graduations, borosilicate glass.

Capacity	
100mL	pack 10 £20.95
250mL	pack 10 £22.95

D Simax®, Heavy Wall Flask with Side Tube

White enamel graduations, borosilicate glass.

Capacity	
100mL	pack 8 £34.95
250mL	pack 6 £42.95

All Pyrex® items are manufactured from thermally and chemically resistant Pyrex borosilicate glass. White enamel graduations and marking spot, graduated to full capacity.

A Pyrex® Conical Flask, Narrow Mouth

Capacity	
50mL	pack 10 £40.95
100mL	pack 10 £40.95
250mL	pack 10 £47.95
500mL	pack 10 £64.95
1000mL	each £10.95

Pyrex® Heavy Duty Conical Flask

Mechanically stronger than a standard flask, reinforced rims reduce chipping and breakages. Designed for larger life and increased user safety.

Capacity	
50mL	each £8.39
125mL	pack 12 £67.95
250mL	pack 12 £72.95
500mL	pack 6 £51.95
1000mL	each £13.95

B Pyrex® Flat Bottom, Narrow Neck Flask

Capacity	
100mL	pack 10 £66.95
250mL	pack 10 £71.95
500mL	each £10.95
1000mL	each £14.95

C Pyrex® Round Bottom, Narrow Neck Flask

Capacity	
100mL	each £9.79
500mL	each £10.95
1000mL	each £17.95
2000mL	each £33.95

D Pyrex® Conical Flask, Wide Neck

Capacity	
100mL	pack 10 £43.95
250mL	pack 10 £51.95

E Pyrex® Heavy Wall Filter Flask with Side Arm

Büchner flasks with heavy wall construction for vacuum filtration applications. Side-arm features a PTFE screwthread connector for easy and safe fitting of 9mm bore vacuum tubing. With tool neck to accept a drilled rubber stopper.

Capacity	
100mL	pack 5 £76.95
1000mL	pack 5 £141.95

F Pyrex® Büchner Plain Side Arm

Pyrex® Heavy Wall Filter Flask with Side Arm

Capacity	
250mL	pack 10 £197.95

G Cork Ring

For supporting round bottom flasks. Outer diameter: 210mm. Inner diameter: 150mm.

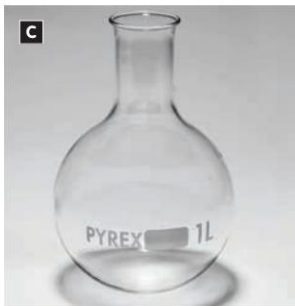
EBR06115	each £18.95
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PYREX® For over 100 years Pyrex® laboratory glassware has been a world leading brand for science education throughout the world. Globally recognised brand associated with quality, reliability, safety, performance and longevity, all Pyrex® products are precision manufactured from Pyrex® 3.3 borosilicate glass which is in-line with rigorous international standards.

Exceptional Science

Pyrex® items benefit from even wall thickness, improving the service life, stable base, reducing thermal shock ensuring less waste, rim profile providing mechanical strength and precision pouring for less risk of spillages.

Pyrex® items are designed for the demanding day to day conditions, maximum chemical toughness, minimum thermal expansion and high resistance to thermal shock making it the ideal material for use in any school laboratory. You know when you bring Pyrex® into your classroom it is the brand you can trust.



A

Azlon

**A Azlon Conical Flask with Screw Cap**

Conical Erlenmeyer flask, wide neck, polypropylene with PP screw cap.

	Capacity	
E8R04425	50mL	each £11.95
E8R04426	250mL	each £15.95
E8R04427	500mL	each £16.95
E8R04428	1000mL	each £21.95

B Stopped Volumetric Flask (Class B)

Volumetric flasks with permanent blue inscriptions. Borosilicate glass. Fitted with neutral, non-staining chemically resistant polypropylene stopper.

	Capacity	
E8R05220	10mL	pack 2 £5.99
E8R05832	50mL	pack 2 £6.79
E8R05833	100mL	pack 2 £8.39
E8R05834	250mL	pack 2 £11.95
E8R05835	500mL	pack 2 £13.95
E8R05836	1000mL	pack 2 £21.95
E8A62790	2000mL	each £23.95

C Pyrex® Stopped Volumetric Flask (Class A)

Volumetric flasks, inscriptions in white enamel. Borosilicate glass. Fitted with chemically resistant polypropylene stopper.

	Capacity	Stopper Size	
E8R05837	50mL	12/21	pack 5 £48.95
E8R05838	100mL	14/23	pack 5 £64.95
E8R05839	250mL	14/23	pack 2 £66.95
E8R05840	500mL	19/26	pack 2 £83.95
E8R05841	1000mL	24/29	pack 2 £101.95
E8R04434	2000mL	29/32	each £47.95

B



PYREX®





A Glassware Class Pack

Contains one each of the following: Beakers (50mL, 100mL, 250mL, 400mL, 1000mL), measuring cylinders (10mL, 25mL, 50mL, 100mL, 250mL), conical flasks (100mL, 250mL, 500mL), plastic beakers (50mL, 100mL, 250mL, 500mL, 1000mL), bulb pipettes (5mL, 10mL, 25mL), glass funnel – 75mm, evaporating basin – 75mL and a crucible – 25mL.

E8R04383 pack **£132.95**

B Azlon Glass Disposal Cardboard Floor Bin

Glass disposal bin, floor standing cardboard with LDPE leak proof liner. Size: W30 x D30 x H70cm.

E8R04384 each **£52.95**

Azlon Glass Disposal Cardboard Bench Bin

Glass disposal bin, bench top, self assemble rigid box. Size: W23 x D23 x H26.5cm.

E8R04385 each **£34.95**

C Glass Cleaner

5 litres of Lipsol® detergent, excellent cleaning performance, ideal for use with laboratory glassware, plasticware, rubber, ceramics and stainless steel.

E8R04536 each **£32.95**

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A Tri-Pour Beakers

Rigid, polypropylene, graduated beakers.

Capacity x graduation

E8R02559	100 x 10mL
E8R06116	100 x 10mL
E8R02560	250 x 10mL
E8R06117	250 x 10mL
E8R02561	400 x 20mL
E8R02562	1000 x 50mL

pack 25	£15.95
pack 100	£63.95
pack 25	£19.95
pack 100	£79.95
pack 25	£22.95
pack 25	£38.95

B Measuring Jug Pack

A set of 4 polypropylene measuring jugs with well formed pouring spouts and handles with capacities of 250mL, 500mL, 1000mL and 2000mL.

E8R05910

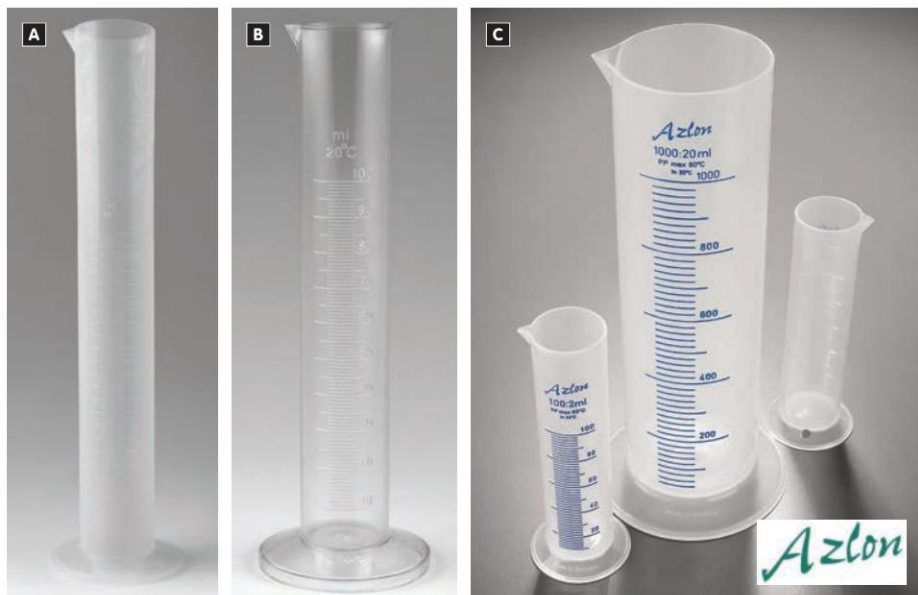
set £26.95

C Azlon Graduated Beakers

- Popular, classic Azlon beakers designed to BS5404: Part 1 1976
- Can withstand temperatures up to 135°C
- Ideal for general laboratory use - straight stable shape
- Good chemical resistance
- Graduations are clearly printed using indelible, solvent resistant ink

Capacity x graduation

E8R03190	50 x 5mL	pack 10	£15.95
E8R03191	100 x 10mL	pack 10	£18.95
E8R03192	250 x 25mL	pack 10	£28.95
E8L10753	400 x 50mL	pack 10	£32.95
E8R03193	500 x 50mL	pack 10	£46.95
E8R03231	1000 x 100mL	pack 5	£26.95
E8R03232	2000 x 200mL	each	£9.59

**A Measuring Cylinders, Polypropylene**

Polypropylene measuring cylinders with excellent chemical resistance. Pentagonal base for stability and to prevent rolling.

	Capacity	Graduations	
E8R05842	10mL	0.2mL	pack 24 £26.95
E8R05843	25mL	0.5mL	pack 12 £14.95
E8R05844	50mL	1.0mL	pack 12 £14.95
E8R05845	100mL	1.0mL	pack 12 £22.95
E8R05846	250mL	2.0mL	pack 6 £18.95
E8R05847	500mL	5.0mL	pack 4 £22.95

B Measuring Cylinders, PMP

Clear plastic measuring cylinders, safer than glass.

	Capacity	Graduations	
E8R05848	25mL	0.5mL	pack 12 £56.95
E8R05849	50mL	1.0mL	pack 12 £63.95
E8R05850	100mL	1.0mL	pack 12 £85.95

C Squat Form Measuring Cylinders, Azlon

Squat design for increased stability, ease of handling and space saving storage. Unique, self-draining base eliminates water collection during washing in a dishwasher. Moulded, blue easy-to-read graduations. High clarity polypropylene - safe, unbreakable, with good chemical and temperature resistance. Anti-suction base - no problem when working on wet surfaces.

	Capacity	
E8L28745	100mL	pack 5 £29.95
E8L28733	250mL	each £7.79
E8L28721	500mL	each £9.59
E8L28344	1000mL	each £12.95

D Litre Set

A set of five containers of different heights and shape. Four of the containers hold one litre, the fifth holds half a litre. Each container is marked in 100mL intervals.

E8A74249

set **£15.95**





A Economy Measuring Cylinders

Borosilicate, amber graduations, round base.

	Capacity	Graduations	
E8L32402	10mL	0.2mL	pack 10 £18.95
E8L32414	25mL	0.5mL	pack 10 £20.95
E8L32426	50mL	1.0mL	pack 10 £21.95
E8R06118	50mL	1.0mL	pack 100 £200.95
E8L32438	100mL	1.0mL	pack 10 £29.95
E8R06119	100mL	1.0mL	pack 100 £275.95
E8R05851	250mL	2.5mL	pack 4 £16.95
E8R05852	500mL	2mL	pack 2 £13.95
E8R05853	1000mL	5mL	pack 2 £27.95



B Measuring Cylinders

Glass graduations and inscriptions in permanent amber stain, screen printed.

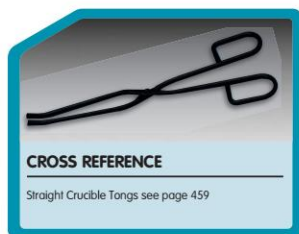
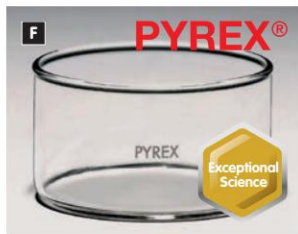
	Capacity	Graduations	
E8A73283	5mL	0.1mL	each £3.59
E8R01869	10mL	0.2mL	pack 10 £37.95
E8R01870	25mL	0.5mL	pack 10 £40.95
E8R01871	50mL	1.0mL	pack 10 £43.95
E8A73325	100mL	1.0mL	each £4.49
E8A73337	250mL	2.0mL	each £6.59
E8R04435	500mL	2.5mL	each £13.95
E8R04436	1000mL	5mL	each £23.95



C Pyrex® Measuring Cylinders

Comprises Pyrex® glass cylinder and polyethylene foot, white enamel graduations. Polyethylene foot absorbs impact and reduces breakage.

	Capacity	Graduations	
E8R04440	10mL	0.2mL	pack 2 £13.95
E8R04441	25mL	0.5mL	pack 2 £12.95
E8R04442	50mL	1.0mL	pack 2 £15.95
E8R04443	100mL	1.0mL	pack 2 £17.95
E8R04444	250mL	2.0mL	pack 2 £29.95



A Flat Bottom Porcelain Evaporating Basins

With spout. Deep form, glazed except outside base.

Capacity	Diameter x height	pack 5
E8R05854	50mL 80 x 20mm	£32.95

B Deep Flat Bottom Porcelain Evaporating Basins

With spout, deep form, glazed inside and outside.

Capacity	Diameter x height	each
E8A52899	22mL 55 x 30mm	£4.09
E8A93403	62mL 70 x 30mm	£9.09
E8A93415	93mL 85 x 32mm	£9.99

C Shallow Round Bottom Porcelain Evaporating Basins

Shallow form, with spout. Sizes up to 115cm glazed inside.

Capacity	Diameter x height	pack 5
E8R05855	70mL 80 x 30mm	£34.95
E8R05856	90mL 85 x 35mm	£40.95
E8R06120	50mL 80 x 30mm	£299.95

D Shallow Form Porcelain Evaporating Basins

Round bottom, glazed inside, with spout.

Capacity	Diameter x height	each
E8A53065	100mL 90 x 35mm	£1.99

E Simax® Crystallising Basin

Borosilicate, flat bottom, basin with spout.

Capacity	Diameter x depth	each
E8A52711	50mL 50 x 33mm	£5.09

F Pyrex® Crystallising Basin

Chemically and thermally resistant. Borosilicate glass without spout.

Capacity	Diameter x depth	pack 10
E8R05857	70 x 40mm	£65.95
E8R05858	150mL 80 x 45mm	£90.95
E8R05859	300mL 95 x 55mm	£91.95
E8R05860	500mL 115 x 65mm	£143.95
E8R04447	900mL 140 x 75mm	£20.95

G Simax® Flat Bottom Evaporating Basin

Chemically and thermally resistant. Borosilicate glass with spout.

Capacity	Diameter x depth	pack 10
E8R05861	90mL 80 x 31mm	£69.95
E8R05862	170mL 100 x 40mm	£75.95

H Pyrex® Flat Bottom Evaporating Basin

Chemically and thermally resistant. Borosilicate glass with spout.

Capacity	Diameter x depth	pack 10
E8R05863	45mL 60 x 33mm	£84.95
E8R05864	90mL 80 x 45mm	£97.95
E8R04448	170mL 95 x 55mm	£9.95
E8R04449	320mL 115 x 65mm	£13.95

I Simax® Round Bottom Evaporating Basin

Chemically and thermally resistant. Borosilicate glass with spout.

Capacity	Diameter x depth	pack 10
E8R05865	100mL 80 x 40mm	£49.95

**A Porcelain Crucibles**

Glazed inside and outside except base. Supplied without lid.

Capacity, cm ³	Diameter x height	pack 5
E8R05866	6 30 x 19mm	£12.95
E8R05867	11 35 x 22mm	£13.95
E8R05868	15 40 x 25mm	£13.95
E8R05869	21 45 x 28mm	£15.95
E8R05870	29 50 x 32mm	£16.95
E8R05871	50 60 x 38mm	£21.95
Capacity, cm ³	Diameter x height	pack 50
E8R06121	21 45 x 28mm	£13.95

B Porcelain Crucible Lid

E8R05872	To fit crucible E8R05867	pack 5
E8R05873	To fit crucible E8R05868	£9.59
E8R05874	To fit crucible E8R05869	£10.95
		pack 50
E8R06122	To fit crucible E8R06121	£117.95

C Squat Form Porcelain Crucibles

Glazed inside and outside, unglazed base. With ringed handled lids.

Capacity, cm ³	Diameter x height	pack 36
E8R05875	15 43 x 23mm	£45.95
Capacity, cm ³	Diameter x height	pack 18
E8R05876	25 47 x 27mm	£28.95
E8R05877	45 57 x 36mm	£47.95

D Nickel Crucibles

Nickel crucibles, 0.5mm thick, supplied without lids.

Capacity, cm ³	Diameter x height	each
E8A59985	25 35 x 35mm	£10.95
E8A59997	30 40 x 40mm	£13.95

E Fireclay CrucibleWith lid. Overall height: 75mm, internal dia. at top: 60mm. Capacity: 140cm³.

E8A59959	each £38.95
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F Crucible Lids

Nickel, for nickel crucibles.

	Diameter	each
E8A60021	35mm	£8.99
E8A60033	40mm	£9.59

A Porcelain Mortar and Pestle

Unglazed inside, glazed outside.
80mm external diameter

E8R01885 pack 10 **£21.95**

130mm external diameter

E8R01887 pack 10 **£35.95**

B Soda Glass Stirring Rods

Soda glass, ends fused, diameter approximately 5mm.
Length

E8A79170 200mm pack 10 **£7.29**

E8R01886 200mm pack 50 **£34.95**

E8R06124 200mm pack 100 **£67.95**

E8A79182 250mm pack 10 **£7.99**

C Polypropylene Stirring Rods

These rods eliminate the possibility of scratching or other damage to glass vessels. They have rounded ends and a high resistance to the majority of laboratory chemicals.
Diameter: 10mm.

Length

E8R01884 150mm pack 10 **£12.95**

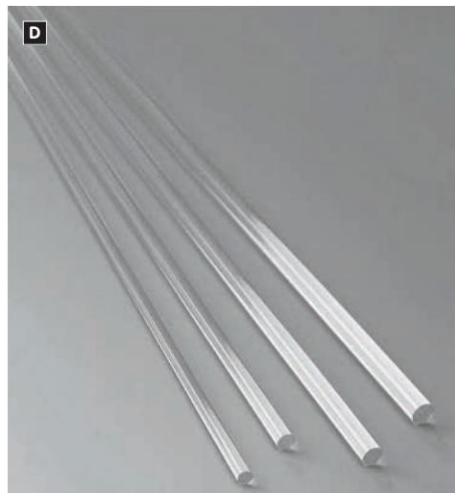
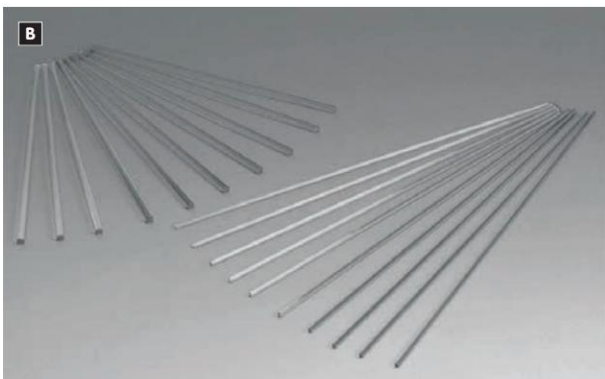
E8R06123 150mm pack 100 **£132.95**

E8A79212 250mm each **£1.99**

D Borosilicate Stirring Rods

1.5m lengths, 5mm diameter.

E8R01888 pack 10 **£6.79**



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**A Reagent Bottles, Amber Glass**

Amber glass with dustproof, Polystop stoppers with hexagonal head.

EBR05878

pack 10 £52.95

B Reagent Bottle, Plastic Coated

A glass bottle with a chemical resistant PVC coating which reduces the hazard of splashing and loss of contents if bottles are dropped or broken. Supplied with dustproof Polystop stoppers. Unlabelled. 250cm³.

EBR05879

pack 10 £76.95

C Weighing Bottle

Clear glass, with interchangeable ground stopper. Dimensions: 50 x 25mm, height x diameter.

EBR05880

pack 10 £71.95

D Bottle, Winchester Pattern, Amber Glass

Narrow mouth, with plastic screw cap and polythene insert. Amber glass. Capacity: 2.5 litres.

EBAS6340

each £5.69

E Bottle Rack

Chemically resistant epoxy coated steel wire rack. Will accommodate 6 flat, round or conical tubes and vessels up 60mm diameter. Autoclavable. Measures L205 x W135 x H104mm.

EBR04729

each £17.95

F Wash Bottle, Polythene

Flexible-walled bottle, oval section with screw cap and bent tube. Liquid is expelled by compressing the bottle. Easily operated with one hand.

Capacity

EBR05908

250mL

pack 12 £13.95

EBR05909

500mL

pack 6 £10.95

G Distilled Water Bottles, Labelled

A range of printed low density polyethylene bottles with round section and swan neck. Bottles are clearly labelled, colour coded and feature the relevant hazard symbols where applicable. Available in two sizes 250mL and 500mL.

Capacity

pack 5

EBR05881

250mL

£17.95

EBR05882

500mL

£22.95

H Wash Bottles with Jet Tip

Traditional and popular square shoulder round wash bottles. Fitted with one-piece PP closures that maintain their shape in use. Closures feature precision jet-tip aperture for fine control.

Capacity

pack 5

EBR06127

250mL

£13.95

EBR06128

500mL

£16.95

I Wash Bottles with Spout

Ergonomic polypropylene wash bottles with an integrally moulded dispensing tube jet tip. Precision tip is ideal for fine liquid jet dispensing.

Capacity

pack 5

EBR06125

250mL

£11.95

EBR06126

500mL

pack 5 £14.95





A Glass Bottles

Wide mouth, clear white glass with screw-on plastic caps with interior waxed discs.

	Capacity	each
E8R01857	15mL	£4.79
E8R01858	30mL	£6.59
E8R01859	60mL	£8.19
E8R01860	120mL	£9.09
	Capacity	each
E8A55542	250mL	£1.32
E8A55554	500mL	£1.50

B Azlon Translucent Polypropylene Bottles

Wide mouth, translucent, heavy duty bottles. Excellent general chemical resistance and autoclavable, can be used to store liquids and solids. Supplied with polypropylene screw caps.

	Height	Capacity	each
E8R05883	82mm	60mL	£10.95
E8R05884	113mm	150mL	£11.95
E8R05885	161mm	500mL	£27.95

C Culture Bottles

Clear glass flat-bottomed bottles with autoclavable only to destroy polypropylene caps. Supplied with screw caps.

	Capacity	each
E8A55759	30mL	£14.95
E8R04858	100mL	£11.95
E8R04859	300mL	£16.95

D Dropping Bottles

Polyethylene dropping bottles. 40mm dropper with captive disc cover.

	Height	Capacity	each
E8R01844	38mm	60mL	£11.95
E8R01845	48mm	150mL	£13.95

E Azlon Dispensing Bottle

Round LDPE bottles fitted with spouted dropper closure, features a captive sealing cap and can be cut. 30mL.

E8R04450	each	£1.32
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F Graduated Bottles

Borosilicate with polypropylene cap and pouring ring. Graduated with label patch. Autoclavable.

	Capacity	each
E8R01849	250mL	£28.95
	Capacity	each
E8A55943	500mL	£3.59
E8A55955	1000mL	£5.69

G Aspirator Bottle

Squat form for stable location on shelves, bench top or in transit. Moulded handle for safe and secure carrying. Clear moulded graduations allowing quick and easy volume assessment. Leakproof heavy duty stopcock opens and closes in a quarter turn. Autoclavable polypropylene for easy cleaning and sterilisation. Caps have moulded drill guides for easy location of probes and feed-lines. 10 litres capacity size: H360 x 280mm. 20 litres capacity size: H420 x 350mm.

	Capacity	each
E8R05961	10 Litres	£54.95
E8R05962	20 Litres	£73.95

H McCartney Bottle

28mL, with fitted Aluminium cap. Autoclavable.

E8R06307	pack 12	£13.95
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I Pyrex® Culture Bottles

Borosilicate glass, PTFE lined screwcap.

	Capacity	each
E8R04550	18 X 100mm	£59.95
E8R04551	25 X 100mm	£11.95
E8R04552	25 X 100mm	£109.95

A



B



C

**A Clear Glass Reagent Bottles**

Clear glass dustproof, interchangeable 'Polystop' stoppers with hexagonal head.

	Capacity	Joint	pack 10
E8R05886	30mL	14.5/23	£29.95
E8R05887	50mL	14.5/23	£33.95
E8R01852	100mL	14.5/23	£24.95
E8R01853	250mL	19/26	£28.95
E8R01854	500mL	24/29	£45.95
	Capacity	Joint	pack 100
E8R06129	250mL	19/26	£239.95

B 'Polystop' Pipette Dropping Bottles

Pipette dropping bottle with a three-piece pipette section comprising a glass dropper, high-density polythene stopper with dust-proof head and vinyl teat. Both stopper and teat are highly resistant to chemical attack by acids and alkalis.

	Capacity	Joint	pack 10
E8R01846	30mL	14.5/23	£35.95
E8R01847	50mL	14.5/23	£37.95
E8R01848	100mL	14.5/23	£39.95

C Amber Dropping Bottle

'Polystop' bottle as item B but with amber glass.

	Capacity	Joint	pack 10
E8R05888	50mL	14.5/23	£47.95

**A****B****C****A Clear Soda Lime Bottles**

Complies with ISO 4796-2. Clear soda-lime glass bottles with ground neck. Supplied with polyethylene stoppers.

	Capacity	pack 10
E8R06296	50mL	£27.95
E8R06289	100mL	£31.95
E8R06292	250mL	£37.95
E8R06294	500mL	£48.95

B Amber Soda Lime Bottles

Complies with ISO 4796-2. Amber soda-lime glass bottles with ground neck. UV absorbent up to 500nm. Ideal for the storage of light sensitive materials. Supplied with polyethylene stoppers.

	Capacity	pack 10
E8R06295	50mL	£29.95
E8R06288	100mL	£31.95
E8R06290	250mL	£35.95
E8R06293	500mL	£49.95

C Dropping Pipettes

Manufactured from clear soda-lime glass with integral ground glass cone on pipette. Supplied with rubber teats. Bottles available separately.

	Capacity	pack 5
E8R06299	50mL	£27.95
E8R06297	100mL	£28.95
E8R06298	250mL	£31.95

**A Dropping Funnels, Open**

Cylindrical, open top with stopcock, borosilicate glass.

	Capacity	
E8R05889	50mL	pack 4 £59.95
E8R05890	100mL	£69.95
E8R05891	Capacity	pack 2 £42.95
	250mL	

B Quickfit Dropping Funnels, Open

Cylindrical, open top with stopcock, borosilicate glass.

	Capacity	Socket size	each
E8A36298	50mL	14/23	£65.95
E8R04455	100mL	14/23	£67.95

C Thistle Funnel, Polypropylene

Unbreakable, safe and easy to clean. Designed to connect to a 6mm outside diameter plastic or glass tube to make a complete funnel of any desired length, or may be used without a stem for small vessels. Supplied with a 250mm length of polypropylene tubing.

E8R05892	pack 10	£78.95
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D Pyrex®, Plain Filter Funnels

Short stem filter funnel.

	Diameter	pack 10
E8R05897	45mm	£107.95
E8R05898	70mm	£111.95
E8R05899	80mm	£125.95
	Diameter	each
E8A63216	105mm	£13.95
E8R04466	150mm	£27.95

E Funnels

Funnels can be used to determine flow rates of sand or water and for simple transfer of liquids or sand from 1 container to another. Set of 3 funnels with diameters of 75mm, 95mm and 120mm, made from flexible yet strong polythene.

E8R06132	set	£7.19
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F Thistle Funnel

Stout walled, soda glass. Stem length: 200mm.

E8A62959	each	£2.59
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G Glassco Conical Separating Funnel

Interchangeable polypropylene stopper and PTFE stopcock. Produced from borosilicate glass.

	Capacity	each
E8R04468	50mL	£24.95
E8R04469	100mL	£29.95
E8R04470	250mL	£36.95
E8R04471	500mL	£40.95
E8R04472	1000mL	£43.95

H Plain Filter Funnels

Borosilicate glass.

	Diameter	pack 10
E8R05893	45mm	£18.95
E8R05894	55mm	£28.95
E8R05895	75mm	£33.95
E8R05896	100mm	£43.95

I Filter Funnels

Unbreakable plastic funnels for separation work with soils and solutions.

	Capacity	pack 10
E8R06006	38mm	£4.79

J Plastic Funnel

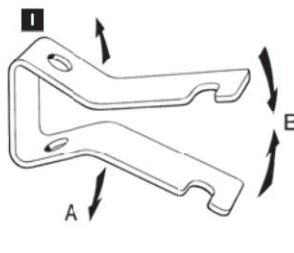
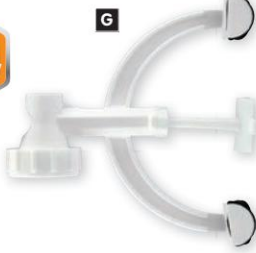
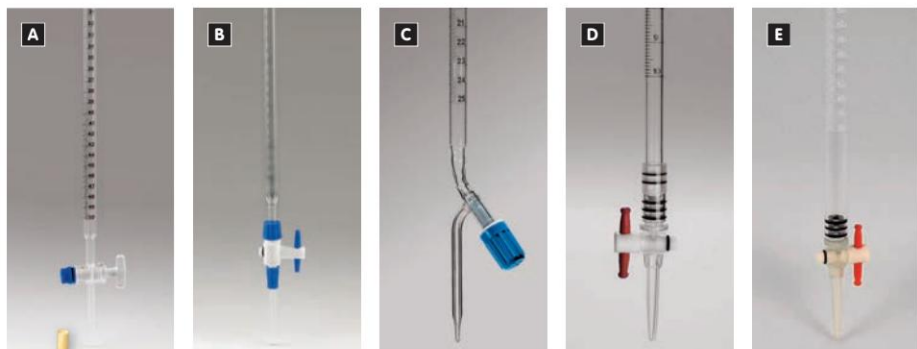
Autoclavable funnels designed for use with standard filter paper. The funnel body is at a 60 degree angle with internal ribs at 58 degrees for rapid filtration. External ribs prevent air locks.

	Capacity	each
E8R06130	65mm	£0.47
E8R06131	90mm	£1.19

K Buchner Funnel Porcelain Plate

This material is capable of withstanding high thermal shocks.

	Funnel diameter	Paper diameter	each
E8R04479	48mm	45mm	£12.95
E8A63277	59mm	55mm	£15.95
E8R04480	75mm	70mm	£17.95
E8R04481	95mm	90mm	£25.95
E8R04482	115mm	110mm	£34.95
E8R04483	130mm	125mm	£40.95



Practical Information

BURETTES CLASS

Class B burettes are accurate to one division. For example, $3.4 \pm 0.1\text{mL}$. These are ideal for standard use in school up to GCSE level.

Class A burettes are accurate to half a division. For example, $6.3 \pm 0.05\text{mL}$. These should be used for 'A'-level where greater accuracy is required.

C Burette Rotaflo (Class B)

Incorporates PTFE interchangeable stopcock. Requires no lubrication. No seizure with caustic solutions. Provides fine drop control. Graduations in permanent amber stain which is fused into the glass and is especially resistant to aggressive cleaning solutions. Locking key provided for assembly. Manufactured from soda-lime glass. Capacity: 50mL. Graduation: 0.10mL. Tolerance: $\pm 0.1\text{mL}$.

E8A57162

each £27.95

D Azlon Burettes (Class B) PMP/PE Stopcocks

Acrylic construction for strength and transparency. Graduations are screen printed in black to ISO 385 Class B accuracy. Suitable for use in educational laboratories especially where breakages often occur. Unaffected by most dilute aqueous solutions, however unsuitable for use with organic solvents. Turning the stopcock through 90° makes it suitable for left or right handed use. Stopcocks can be removed for easy cleaning.

Capacity	Sub divisions	Tolerance	
50mL	0.1mL	0.1mL	each £36.95

E Economy Burette

Clear acrylic burette made in TPX with leak proof stopcock, 50mL capacity.

E8R05223

each £7.19

F Burette Stand

MDF, with cork-lined wood clamp fitted with plastic screws. Base fitted with four rubber feet for stability. Overall height: 490mm. Base: 200 x 110mm.

Direct Delivery – up to 4 weeks

E8A57228

each £53.95

Polypropylene Burette Clamp

To hold one or two burettes. Fitted with rubber grips to prevent slipping. For rods with diameter 10 to 14mm.

G E8A57198 Single each £7.69

H E8A57204 Double each £9.39

I Delrin Burette Clamp

One-piece moulded clamp in acetyl plastic to hold a 50cm³ burette to a rod (diameter 12 to 13mm) by a simple spring-loaded friction action. NOT suitable for use with plastic burettes.

E8A57216

each £2.89

A Burette (Class A)

Amber graduations with single-bore stopcock and retaining clip.

	Capacity	Graduations	Tolerance	each
E8A57071	50mL	0.1mL	0.05mL	£41.95

Burettes (Class B)

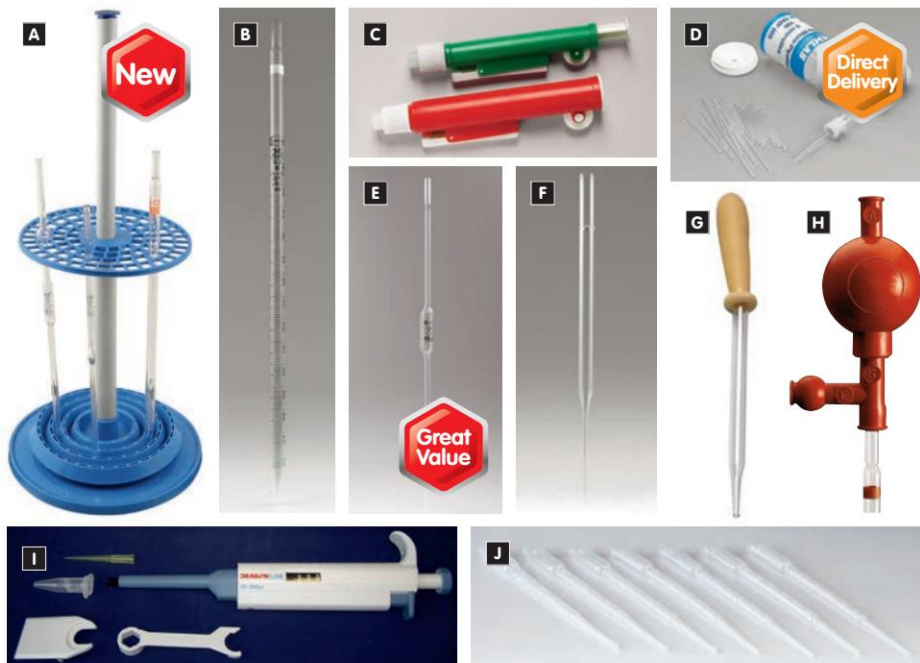
Amber graduations, stopcock with moulded screw thread, enabling the screw fitting to be adjusted, giving any tension required on the stopcock key.

	Capacity	Graduations	Tolerance	each
E8A57113	25mL	0.1mL	0.1mL	£13.95
E8A57125	50mL	0.1mL	0.1mL	£13.95
E8A57137	100mL	0.2mL	0.2mL	£17.95

B Burette (Class B) Interchangeable Stopcock

Blue graduations, with PTFE interchangeable stopcock giving excellent flow control. Requires no lubrication and is highly resistant to chemical attack. Capacity: 50mL. Graduations: 0.1mL. Accuracy: $\pm 0.1\text{mL}$.

E8A57149 each £19.95

**A Pipette Stand Rotary**

Can hold maximum of 94 pipettes and rotate on a vertical axis. The lower rotating disc has four concentric troughs with tapered sides and open bottoms which cradle the pipette tips protectively and permit water drops to run off. Stand can be easily assembled and disassembled. Made of polypropylene.

E8R06141 each **£10.95**

B Class B, Straight Form, Graduated, Pipettes

With permanent stained graduations. Colour codings are fused ceramic enamel with glass finish.

E8R05900	2 x 0.02mL	pack 5 £9.59
E8R05901	10 x 0.1mL	£11.95
E8R05902	25 x 0.2mL	£11.95

C Pipette Filler

Easy to use with finely adjustable thumb wheel. For 10mL.

E8A78062	Green	each £6.79
E8R01863	Red	pack 10 £69.95

D Disposable Micropipettes

Disposable micropipettes made from borosilicate glass that are suitable for pipetting microlitre quantities in a wide range of applications, e.g. spotting chromatograms. Each tube contains an accurate set volume from end to end. Used in conjunction with a pipette holder they are filled by capillary action and liquid is expelled by compressing the teat.

Direct Delivery – up to 10 days

E8A77859	5µL	pack 100 £29.95
E8A77860	10µL	pack 100 £29.95

E Class B, Bulb Form, Pipettes

Single permanent amber stained graduation on upper stem.

Capacity	pack 5
E8R05903 5mL	£9.59
E8R05904 10mL	£11.95
E8R05905 20mL	£16.95
E8R05906 25mL	£17.95

F Pipettes

Pasteur type. Soda glass. WITHOUT teats. Length: 150mm approx.

E8A77793 pack 250 **£9.00**

G Glass Dropping Pipettes

Glass body, length 125mm, supplied with rubber teat. Useful for dispensing liquid from test tubes.

E8A77781 pack 5 **£7.19**

Dropping Pipettes

Capacity: 1.7mL approx., rubber teat, length: 40mm, 110mm overall. Narrow mouth.

E8A77768 pack 10 **£11.95**

H Bulb Type, Pipette Filler

For pipetting noxious solutions, microbial suspensions and other harmful or unpleasant solutions. Comprises a bulb and three pinch valves controlling influx and efflux of pipette contents. Bulb diameter: 54mm.

E8A78025	Green	each £5.79
E8R01866	Green	pack 10 £41.95
E8A78037	Red	each £5.79
E8R01865	Red	pack 10 £41.95

I Adjustable Micropipettes

These variable volume micropipettes are sturdily designed, with volumes ranging from 5–50µL and 20–200µL. They are easy to use, highly accurate and use standard micropipette tips. The volume is easily selected by twisting the top. The lightweight design and tip ejector makes operation fast and easy. A tool and instructions are included for self-calibration.

5–50µL Microlitre	each £83.95
E8R05604	

20–200µL Microlitre	each £89.95
E8R05605	

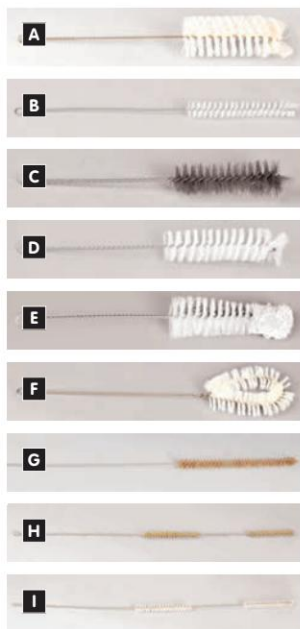
J Disposable, Graduated, Pipettes

Translucent pipettes with precise graduations and good chemical resistance. Length: 155mm. Special inert polythene. 3mL x 0.5mL.

E8A77744 pack 500 **£10.95**

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A Cylinder Brush

Brush with fan-shaped end on stainless steel wire handle. Suitable for erlenmeyer flasks, cylinders and beakers. Total length: 360mm, brush length: 120mm, brush diameter 50mm.

EBR05382 Bristle each **£3.39**
EBR05383 Nylon each **£4.19**

B Semi Micro Test Tube Brush

For test tubes 6-10mm in diameter, total length 175mm, length of fiber section 70mm and diameter 10mm.

EBR05373 each **£1.20**

C Fan Bristle Test Tube Brush

With fan-shaped end, on stainless steel wire handle. 190mm, diameter 29mm, total length 230mm.

EBR05374 each **£1.20**

D Nylon Test Tube Fan Brush

With fan-shaped end, on stainless steel wire handle. 190mm, diameter 29mm, total length 230mm.

EBR05375 each **£1.79**

E Nylon Test Tube Brush

Nylon with cotton yarn tip, on stainless steel wire handle with tapered head.

24-13mm, for tube diameter 12-16mm

EBR05376 each **£1.79**

35-25mm, for tube diameter 16-25mm

EBR05377 each **£1.79**

F Beaker Brush

400mm long stainless steel wire handle. Size 150 x 85mm.

EBR05378 each **£3.59**



G Burette Brush

Bristle, on stainless steel wire handle. For burette cap. 50ml, head diameter 19mm, length 760mm.

EBR05379 each **£3.59**

H Pipette Brush

Bristle, head size 125 x 10mm, overall length 650mm for pipettes and tubes from 8-12mm diameter.

EBR05398 each **£2.99**

I Pipette Brush with Nylon Head

Nylon, head size 125 x 10mm, overall length 650mm for pipettes and tubes from 8-12mm diameter.

EBR05381 each **£2.99**

J Universal Tube Rack

Quickly change tube sizes with this adaptable polypropylene rack. Open the iris with a turn of the knob or directly insert a tube into the opening. Holds up to 12 tubes of the same size from 16 to 30mm diameter. Accepts tubes from 15ml to 50ml. Test tubes not included.

EBR04539 each **£31.95**

K Z Pattern Test Tube Stand

Sturdy, corrosion-resistant "Z" pattern with 3 rows of holes. Stands can nest together for easy storage. Not suitable for use with solution containing mercury salts. Dimensions: 200 x 125 x 75mm. 5 holes: 28mm diameter, 6 holes: 19mm diameter, 8 holes: 13mm diameter.

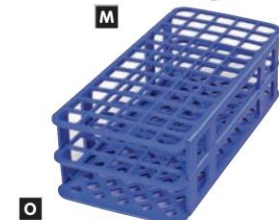
EBA85879 each **£8.39**

EBR01867 pack 10 **£69.95**

L Polythene Test Tube Stand

Durable non-corrosive rigid polythene 3-tier rack to take 20 small test tubes. Dimensions: L320 x H125 x W70mm. Diameter 20mm.

E8664716 each **£10.95**



M Fold and Snap Test Tube Rack

Easy to assemble polypropylene rack fold and snap together. Autoclavable. 13mm has 90 wells, overall size: L245 x W105 x D63mm. 17mm has 60 wells, overall size: L245 x W108 x D72mm. 21mm has 40 wells, overall size: L245 x W108 x D72mm.

EBR04542 13mm each **£10.95**

EBR04543 17mm each **£10.95**

EBR04544 21mm each **£10.95**

N Steel Test Tube Holder

Plated spring steel wire holder with finger grips. The jaws will accept tubes up to 40mm diameter. Overall length: 130mm.

EBA85789 each **£0.97**

O Delrin Test Tube Racks Half Size

Extra tough to resist most acids, solvents and heat. Ideal for smaller spaces. Molded index co-ordinates and flat labelling areas keep samples organised. Half sized racks are convenient for incubators, fume hoods, refrigerators and other tight spaces. 16mm has 36 wells, overall size: L127 x W127 x D70mm. 25mm has 16 wells, overall size: L120 x W122 x D92mm.

EBR04540 16mm each **£10.95**

EBR04541 25mm each **£15.95**

P Wooden Test Tube Holder

Wood, with steel spring for closing jaw. Length: 180mm. Accepts tubes 11-19mm.

EBA85765 pack 10 **£7.59**

Q Brass Test Tube Holder

Strong spring clip comprising stout hard rolled-brass strip, mounted in hardwood handle. Overall length: 223mm. Test tubes accepted: 12-43mm.

EBA85777 each **£4.29**

**A Economy Test Tubes with Rim**

Borosilicate glass, allows temperatures upto 500°C.
Excellent resistance to chemical attack.

	Diameter	Length	pack 100
E8R04797	10mm	75mm	£15.95
E8R04798	12mm	75mm	£17.95
E8R04799	16mm	100mm	£23.95
E8L32384	16mm	125mm	£29.95
E8R04800	18mm	150mm	£29.95
	Diameter	Length	pack 150
E8L32396	25mm	150mm	£67.95

B Economy Test Tubes Rimless

Borosilicate glass, allows temperatures upto 500°C.
Excellent resistance to chemical attack.

	Diameter	Length	pack 100
E8R04801	10mm	75mm	£17.95
E8R04802	12mm	75mm	£19.95
E8R04804	16mm	125mm	£37.95
E8R04805	18mm	150mm	£40.95

C Simax Test Tubes

Test Tubes With Rim, Borosilicate Glass.

Wall thickness 1.0mm

	Diameter	Length	pack 100
E8R06160	10mm	75mm	£21.95
E8R06161	12mm	75mm	£23.95

Wall thickness 1.2mm

	Diameter	Length	pack 100
E8R06151	16mm	100mm	£34.95
E8R06152	16mm	125mm	£43.95
E8R06154	16mm	150mm	£47.95
E8R06156	18mm	150mm	£52.95
	Diameter	Length	pack 50
E8R06159	24mm	150mm	£35.95

Wall thickness 1.8mm

	Diameter	Length	pack 100
E8R06153	16mm	125mm	£43.95
E8R06155	16mm	150mm	£47.95
E8R06157	18mm	150mm	£50.95
	Diameter	Length	pack 50
E8R06158	24mm	150mm	£53.95

D Test Tube with Bent Side Arm, Borosilicate

With horizontal side arm bent downwards at 45°. Size: Height 150 x diameter 24mm.

E8A85716 each **£10.95**

**TO ORDER**

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For over 100 years Pyrex® laboratory glassware has been a world leading brand for science education throughout the world. Globally recognised brand associated with quality, reliability, safety, performance and longevity, all Pyrex® products are precision manufactured from Pyrex® 3.3 borosilicate glass which is in-line with rigorous international standards.

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PYREX®

A Pyrex® Glass, Medium Wall Test Tube with Rim

Borosilicate glass, allows temperatures upto 500°C. Excellent resistance to chemical attack.

Diameter	Length	pack 100
Medium wall: Wall thickness 1.0mm		
E8R04484 10mm	75mm	£35.95
E8R04485 12mm	75mm	£45.95
Medium wall: Wall thickness 1.2mm		
E8R04486 16mm	100mm	£63.95
E8A85522 16mm	125mm	£51.95
E8A85534 16mm	150mm	£58.95
E8A85546 18mm	150mm	£69.95
Diameter	Length	pack 50
E8A85569 24mm	200mm	£75.95
Boiling Tubes		
E8A85558 24mm	150mm	£91.95

B Pyrex® Glass, Heavy Wall Test Tube with Rim

Test tube with a heavy wall to provide extra mechanical strength. Robust construction reduces possibility of breakages. Borosilicate glass for high resistance to thermal shock and chemical attack.

Diameter	Length	pack 100
Heavy wall: Wall thickness 1.8mm		
E8R04488 16mm	125mm	£90.95
E8A85662 16mm	150mm	£93.95
E8R04489 18mm	150mm	£107.95
Boiling Tubes		
E8A85674 24mm	150mm	£137.95

C Pyrex® Glass, Medium Wall, without Rim Test Tube

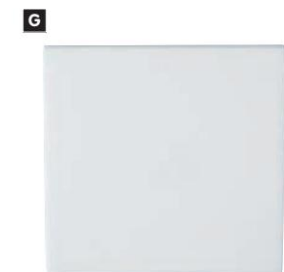
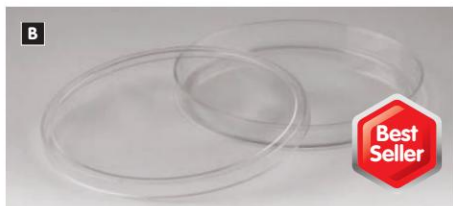
Borosilicate glass, allows temperatures upto 500°C. Ideal for microbiology culture work. Excellent resistance to chemical attack.

Diameter	Length	pack 100
Medium wall: Wall thickness 1.2mm		
E8A85595 16mm	125mm	£59.95
E8A85601 18mm	150mm	£69.95
E8A85613 24mm	150mm	£95.95

D Glass Heavy Wall without Rim Test Tube

Rimless test tube with a heavy wall to provide extra mechanical strength. Robust construction reduces possibility of breakages. Borosilicate glass for high resistance to thermal shock and chemical attack.

Diameter	Length	pack 100
Heavy wall: Wall thickness 1.8mm		
E8R04490 16mm	125mm	£90.95
E8R04492 24mm	150mm	£138.95



A Glass Petri Dishes

Clear crystal glass. Diameter 90mm. Depth 15mm.

E8A77215 pack 10 £12.95

B Standard Depth Petri Dishes, Disposable

Clear plastic, depth 15mm. Supplied in sterile packs. Will deform on autoclaving.

	Diameter	
E8A77239	55mm	pack 15 £2.39
E8H64838	90mm	pack 20 £2.09
E8H64826	90mm	pack 500 £47.95

C Bell Jar

Borosilicate glass. ground flange with stopper. Socket size: 29/32, diameter: 150mm, height: 250mm.

E8R05912 each £71.95

D Desiccator

Borosilicate glass. Lid diameter: 300mm, disc diameter 290mm, base diameter: 392mm.

E8R05913 each £161.95

E Watch Glasses

Concave, best quality, with ground edges.

	Diameter	
E8A90505	70mm	pack 10 £3.19
E8A90517	80mm	pack 10 £3.99

F Polypropylene Tiles

White, with 12 cavities 22mm diameter. 118 x 93 x 11mm.

E8R05907 pack 10 £25.95

G Acrylic Tile

Plain flat white. 100 x 100mm.

E8A86903 each £1.50

H Porcelain Tile

White, with 12 cavities 22mm diameter. 112 x 90 x 12mm. Weight 0.25kgs.

E8L76740 each £3.09

I Chinagraph Pencil

Chinagraph pencils are ideal for marking on a wide variety of different surfaces, including glass.

E8R06162 pack 12 £17.95





Practical Information

BUNSEN BURNERS

Natural gas is almost entirely methane. Burners are therefore designed for the high calorific value (approximately 38 MJm⁻³) of this gas. The delivery pressure of natural gas is approximately 2 x 103 Pa (Nm⁻²). Bottled gases liquify at a fairly low temperature and can be easily stored and transported in steel cylinders. The principal gases used are propane (C₃H₈) and butane (C₄H₁₀). The gas cylinders must always be used with a suitable pressure reducing valve and regulator which is available from the suppliers of the gas. The calorific value of propane is 93.2 MJm⁻³ and its normal delivery pressure is 3500 Pa (Nm⁻²). Butane has a calorific value of 119.3 MJm⁻³ and has a delivery pressure of about 2750 Pa (Nm⁻²). The Natural Gas Bunsen Burner burns approximately 108 litres per hour of natural gas. The Bottled Gas Bunsen Burner burns approximately 144 litres per hour of bottled gas.

C



D



A Electric Burner

Designed to carry out all the experiments that a Bunsen burner can without the use of a gas supply. The electric burner is supplied with a protection grill that, when attached, minimises the risk of accidental burns. There is a threaded hole in the top plate for a support rod and the outer cover provides holes for the attachment of support trays.

Examples of experiments which can be carried out using the electric burner. Combustion of magnesium and other metals, reduction of cupric oxide, boiling water, dehydration of copper sulphate crystals.

Specification:

- Temperature of heater: up to 920°C
- Four insulating shoes
- Power on and heating indicators
- Temperature control dial
- The separate electric casing avoids any accident due to liquid spillage

- Weight: approximately 2kg
- Overall dimensions: L310 x W200 x H110mm
- Rating: 500W
- Power requirements: 220 - 240V

E8L76958

each **£179.95**

B Bunsen Burner

Nickel-plated burner tube with rotatable air regulator and a cylindrical rifled connector, mounted on an enamelled pressed-steel base. Burner tube: 100 x 13mm, height x diameter, base: 80mm diameter. Overall height: 140mm, connector: 10mm o.d.

Natural Gas

E8A57241

E8R01874

each **£14.95**

pack 10 **£83.95**

Bottled Gas

E8A57253

each **£9.19**

E8R01914

pack 10 **£89.95**

C Triangular Tripod Stand

Triangular top, stainless steel. Length of one side: 130mm, height: 200mm.

E8A88973

each **£4.19**

D Triangular Flat Top Tripod Stand

Triangular top. Length of side: 125mm, height: 200mm.

E8A88997

each **£6.29**

A Bench Mats

Calcium silicate bench mats that are non-combustible and moisture/chemical resistant. Composed of a calcium silicate matrix reinforced with cellulose fibre. Does not contain asbestos, inorganic mineral or man made fibres. Thickness 4mm.

E8A55335	150 x 150mm	pack 10 £7.49
E8A55347	230 x 230mm	pack 10 £9.59
E8R00163	300 x 300mm	pack 10 £14.95

B Straight Crucible Tongs

Jaws, corrugated inside. Epoxy coated iron.

E8A87219	150mm	each £2.79
E8A87221	200mm	each £2.79

C Crucible Tongs with Bow

Jaws, corrugated inside. Iron.

E8A87257	150mm	each £1.79
E8A87269	200mm	each £2.39

D Beaker Tongs

Stainless steel, silicone covered jaws. For any size beaker from 250 to 1500cm³. Length: 360mm, width of jaws: 70mm.

E8A87282		each £57.95
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E Iron Gauze

Square, 20 mesh.

E8A64219	125mm	pack 10 £7.59
E8A64221	150mm	pack 10 £7.89

F Iron Gauze with Ceramic Centre

Square, with flat circular ceramic centre.

E8L16354	150mm	pack 10 £10.95
E8L12385	125mm	pack 10 £10.95

G Pipeclay Triangles

On stout iron wire, pipeclay stems.

E8A88959	65mm	pack 10 £3.99
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H Methylnated Spirit Burner

Glass burner and plastic cap, with wick and wick holder. Capacity: 100cm³, height: 105mm. Wick size: 10cm.

E8A57409		each £4.39
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Spare Wicks For Spirit Lamp

Pack of 10 wicks that can be used with the Methylnated Spirit Burner.

E8A57411		pack 10 £5.19
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I Wood Splints

For lighting burners or testing for oxygen (glowing splint), etc. Supplied in bundles of approximately 1000 splints.

E8A81930		bundle £6.39
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J Night Light Stand

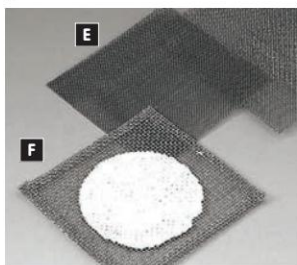
This simple device makes the melting of food fats, wax and other materials easy.

E8A81991		each £9.59
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K Night Lights

Long burning candles, each with separate foil tray.

E8A57782		pack 30 £3.69
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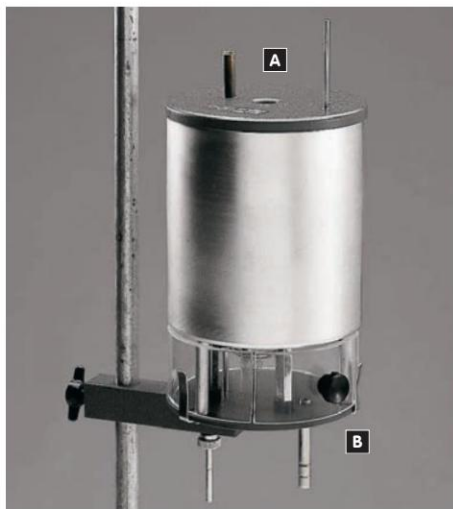




SAVE

Night Light Offer
Buy 5 Stands and 1 pack of Night Lights Together

E8R06096 pack **£41.95**



A Revised Combustion Apparatus

Copper cylinder, 100 x 75mm diameter, the bottom of which is in the shape of a shallow re-entrant cone which forms the top of the combustion chamber. A spiral copper heat exchanger extends upwards through the cylinder, its outlet normally being connected to a condenser unit using a filter pump to draw the products of combustion through the apparatus.

The cylinder is housed in an aluminium outer jacket, 130 x 100mm diameter, with a drop on cover having apertures to pass the outlet of the heat exchanger, the wire stirrer and a bored and split rubber stopper, also supplied, to accommodate a thermometer. The outer jacket has three legs 40mm long which, when the calorimeter is standing on the base unit, provide the combustion chamber space and the sides of which take the form of a circular Perspex shield with removable door.

Supplied WITHOUT thermometer or condenser unit.

E8H24841

each £175.95

B Base Unit

Comprises a metal disc, 100mm diameter, with a boss for mounting on a 13mm retort rod. The unit forms the floor of the combustion chamber and has an inlet tubule, 6mm diameter, for the oxygen supply, and a pair of pillars carrying the low voltage igniter coil. Also incorporated is a moveable crucible support enabling the crucible to be raised up to the igniter coil from outside the assembled apparatus.

Supplied WITHOUT retort stand, crucible or spirit lamp.

E8R00546

each £78.95

C Cobalt Glass

When flame testing for the detection of potassium ions, any sodium ions present mask the lilac colour with intense yellow, hence the presence of potassium may go undetected. However, on viewing the flame through the cobalt glass the presence of potassium is easily observed.

Dimensions: 75 x 50 x 1mm.

Direct Delivery - up to 10 days

E8A62133

each £10.95

D Wire Holder

Nickel plated brass with screw chuck which accepts wire or needles up to 0.56mm dia. (24swg).

E8F66652

each £2.59

E Inoculating Loops

Nichrome wire with 2mm diameter loop formed at one end. For use with the Inoculating Loop Holder Item C. Length: 50mm.

E8A64580

pack 5 £4.19

F Nickel Chrome Wire 26 SWG

Gauge 26 SWG, Diameter 0.46mm

E8R05726

125g reel £21.95

Gauge 32 SWG, Diameter 0.27mm

E8R05737

125g reel £23.95

G Deflagrating Spoon and Cap

Steel cup and rod held by cork in a dished aluminium cap. Length 350mm, diameter of cap: 88mm, diameter of cup: 18mm.

E8A60100

each £3.69

H Deflagrating/Combustion Spoon

Heavy gauge stainless steel wire, for use in test tubes 150 x 25mm. Shaft shaped to prevent contact with wall. Length: 200mm, diameter of cup: 7mm.

E8A60094

each £2.89

**A 4 Cell Holder (BEK)**

Takes 4 D cells. 4mm sockets enable different voltages to be selected.

E8R01324

each £17.95

B Cell Holder

Single cell holder with 4mm sockets, ingeniously moulded so a cell can only be inserted the correct way around. Takes one D cell. For use with either Basic Electricity Kit.

E8R01323

each £2.79

C Stackable Cell Holders

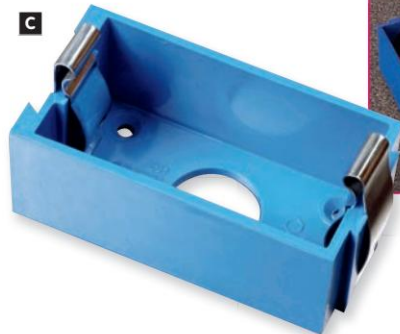
A versatile approach to cell holder design, these units (each accommodating an HP2 size cell) will link together, both electrically and mechanically, to provide battery boxes of any desired voltage. The stacking system provides tapings every 1.5V and the holders may be permanently baseboard mounted if desired. Supplied individually.

E8H30476

each £5.99

D Cell Holders

	Number of cells	Total voltage	each
E8C51809	2 x AA (I-HP7)3		£0.23
E8C51847	1 x C (I-HP11) 1.5		£0.29
E8C51872	1 x D (I-HP21) 1.5		£0.42

**CROSS REFERENCE**

Basic Electricity Kit (BEK) see page 211

Economy Science

A


Type	AA, LR6	AAA, LR03	9V, 6LR61	C, LR14	D, LR20
Voltage	1.5V	1.5V	9V	1.5V	1.5V
Code	E8R05730	E8R05731	E8R06104	E8R05733	E8R05734
Pack size	pack 10	pack 10	pack 10	pack 10	pack 10
Price	£3.59	£4.79	£10.95	£9.59	£11.95

Professional Alkaline Battery

A Advanced Industrial Alkaline Battery

Advanced, longer life professional Alkaline brand. Industrial by Duracell, the replacement for Procell.

- Ideal for any device
- Improved performance
- Ultimate trusted energy source
- 7 year shelf life
- Guaranteed against leakage
- Packed in reclosable boxes

Alkaline Batteries

B General Purpose Batteries

Premium general purpose battery:

- Excellent performance in the widest range of devices
- Ideal for audio devices and projects
- 7 year shelf life
- Guaranteed against leakage

Best Value for Low Usage Items

C High Power Zinc Chloride Batteries

The economy alternative for low usage or low power consumption appliance.

- Ideally suited for clocks, calculators and remote controls
- 3 year shelf life
- Guaranteed against leakage

Rechargeable for Less Waste

D Rechargeable Nickel Metal Hydride Batteries

Protect the environment by producing less waste - and at a lower cost!

- Can be recharged hundreds of times
- Ideal for heavy users and high drain devices - digital audio, motor powered, cameras
- Capacities: AA 2000mAh, AAA 850mAh, C and D 2500mAh, 9V 175mAh

Lithium Batteries

E Energizer Lithium for Digital Cameras

Ultimate Lithium AA and AAA batteries offer the highest capacity for the size in the latest high power digital devices

- Up to 7 times longer lasting in digital cameras
- Ideally suited for DVD players, MP3 players, GPS systems and high intensity torches
- 15 year shelf life
- Excellent low temperature performance
- Lightweight

Images for illustration purposes only.

B


Type	AA, LR6	AAA, LR03	9V, 6LR61	C, LR14	D, LR20
Voltage	1.5V	1.5V	9V	1.5V	1.5V
Code	E8R05078	E8R05077	E8R04985	E8R04986	E8R04987
Pack size	pack 10	pack 10	pack 12	pack 12	pack 12
Price	£2.39	£2.39	£16.95	£10.95	£16.95

C


Type	AAA, R03	AA, R6	9V, PP3	C, R14	D, R20
Voltage	1.5V	1.5V	9V	1.5V	1.5V
Code	E8R05400	E8R05409	E8R05410	E8R05411	E8R05412
Pack size	pack 4	pack 4	each	pack 2	pack 2
Price	£0.71	£0.71	£0.83	£0.71	£1.19

D


Type	AA, HR6	AAA, HR03	9V, HR22	C, HR14	D, HR20
Voltage	1.2V	1.2V	9V	1.2V	1.2V
Code	E8R02103	E8R04992	E8R04993	E8R04994	E8R04995
Pack size	pack 4	pack 4	each	pack 2	pack 2
Price	£9.59	£11.95	£11.95	£11.95	£11.95

E


Type	AA, LR6	AAA, LR03
Voltage	1.5V	1.5V
Code	E8R04998	E8R04999
Pack size	pack 4	pack 4
Price	£11.95	£11.95



A Flashlamp Bulbs, Round

All these bulbs are screw-in M.E.S. (Medium Edison Screw) bulbs that fit standard bulbholders. Their terminals are the blob on the base and through the side of the bulb. Make secure connections using a bulbholder. Pack of 10.

E8A56716	125V	0.25A	pack 10	£5.69
E8A56728	2.5V	0.3A	pack 10	£5.99
E8A56739	3.5V	0.3A	pack 10	£3.39
E8R01295	4.5V	0.3A	pack 10	£7.19
E8A56753	6.5V	0.3A	pack 10	£3.99
E8A56765	6V	0.04A	pack 10	£5.39
E8A56777	12V	0.5A	each	£1.19

B Unmounted Bulbholder, M.E.S.

Ideal for incorporation into simple electrical and electronic circuits. Of rolled, plated brass construction with 'solder tag' terminations. The riveted assembly eliminates the possibility of unauthorised dismantling.

E8A56984	pack 10	£1.02
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C Low Voltage Bulbs - 19mm

With double contact, S.B.C.
Dimensions: 35 x 19mm diameter approx.

E8R01994	12V	5W	pack 10	£6.29
E8R01995	12V	10W	pack 10	£6.29

D Low Voltage Bulbs - 38mm

With straight axial filament; double contact, S.B.C.
Dimensions 55 x 38mm diameter approx.

E8A56820	12V	24W	each	£1.56
E8R01296	12V	36W	each	£1.99
E8A56844	12V	48W	each	£2.39

E Impact Resistant Lamp

This replaces the Carbon Filament Lamp, offering similar features for two common activities in Physics.

A zig-zag filament provides a bright, clear object for the Pinhole Camera Kit, from which to create experimental images. The lamp's nominal resistance with 240V applied is close to 1500 ohms, but when lower voltages are connected (5 to 30V d.c. or a.c.) the resistance is typically 500 to 700 ohms. Usefully illustrating variation in filament resistance with temperature.

Style: Clear glass with bayonet cap (BC)
Rating: 240V 40W.

Size: 105 x 60mm.

E8A56923	each	£16.95
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F Pygmy Bulb

Bayonet cap: 240V 15W white. For use as illuminant on optical benches, etc.

E8A56909	each	£2.59
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G Bulbholder, M.E.S.

Mounted bulbholders, for easy connection to electrical circuits. Overall diameter: 30mm.

E8A56972	pack 10	£2.29
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H Quartz Iodine Projector Bulb

12V 100W ceramic base with two pins. Dimensions: overall 45 x 10mm diameter approx; filament height: 24mm.

E8A56879	each	£24.95
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I Festoon Bulb

12V 3W for use with Whitley Bay smoke cell, and multiple light sources.

E8R01297	each	£1.32
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Festoon Bulb - 10W

12V, 10W for use with the Economy Science Ray Optics Box BBH77390.

E8R01298	each	£1.44
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J Ultraviolet Lamp TUV6

A tubular bulb with an E.S. cap. For use on 200-260V a.c. mains supply, no control switch gear required. The principal emission of the bulb is at 253.7nm, giving an energy output of 85mW at this wavelength.

- Nominal mains voltage: 220 V a.c.
- Lowest starting voltage: 170V
- Tube current: 0.027A
- Tube consumption: 6W
- Burning position: All positions
- Dimensions: 150 x 26mm diameter
- Light centre: 92mm from tip of cap

E8R01299	each	£137.95
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A



B



C



D



E



F



G



H



I



J



K

L

A Coast™ Inspection Torch

A handy inspection torch with a pocket clip. Water and impact resistant with 54 lumens. Maximum beam distance 24 metres. Uses 1 x AAA battery, included.

E8R05148

each **€9.95**

B Metal Bodied LED Torch

Excellent value, metal LED torch from Energizer with 5 Nichia white LED's which never need replacing. 35 lumens. Designed to last with a robust metal casing and large tail switch. 2 x AA alkaline batteries included.

E8R05418

each **€7.19**

Soft Touch Torch

Infapower's soft touch torch offers great value for money. Features include a soft touch rubber feel for comfortable grip. Extra bright F8 LED, producing 11 lumens output. It is also splashproof IP44 rated and is shock resistant. Practical hanging strap included.

C E8R06318 Small

each **€4.19**

D E8R06320 Large

each **€6.59**

E Flexible Desk Lamp

Versatile desk lamp with a flexible neck. Metal and plastic construction and integral on/off switch. Height: 340mm approx.

E8R05225

each **€12.95**

F Torches

Ideal for class use when experimenting with lenses, filters and mirrors. Each torch requires two AAA batteries (not supplied).

E8R02139

pack 10 **€26.95**

G Panasonic Battery 4R25R/B

Battery Voltage: 6.0 Volts.

E8R05678

each **€2.39**

H Universal Battery Charger

Charges 4 x AA, 4 x AAA, 2 x 9V, 4 x C or 4 x D rechargeable Nickel Metal Hydride batteries with an LCD charge status panel and bad battery detection. Reverse polarity protection. 3-5 hour charge time.

E8R05008

each **€31.95**

I LED Universal Lamp

- 20x Super-bright Seoul SMD LEDs with special lens optics
- Operating time of approx. 6 hours with full battery
- Additional switching stage for 3x Cree LEDs in the luminaire head with extra long light duration
- Plastic handle with integrated magnet, 360° bendable
- 360° swivelable, retractable hanging hook
- On-Off switch
- Supplied with 3 x AAA batteries

E8R06333

each **€11.95**

J Varta LED Floating Lantern

A reliable and durable lantern torch, ideal for many activities. Floats on water, so suitable for outdoor use. The 0.5 watt plug-in LED can run for up to 160 hours with 35 lumens brightness and a long beam range, up to 140 metres. Requires 1 x 6V 4R25X longlife battery (supplied).

E8R06211

each **€9.59**

K Button Cell

Silver oxide button cell type LR44.

E8R00295

1.5V

each **€2.39**

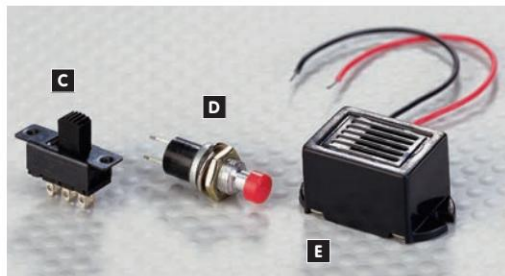
L Duracell Batteries Value Pack

Value pack of 100 AA batteries.

E8R06210

pack **€83.95**

**GLOBAL
DELIVERY AND
AWARD-WINNING
SERVICE**

**A Crocodile Clips**

With strong spring and clamping screw for wire.

E8A58671

pack 10 **£1.60**

B Crocodile Clips - Plastic Sleeved

An essential resource for any student building circuits, these allow addition of materials for investigation of conduction. Thread wire through and screw clockwise, or push-fit onto the ends of standard plug leads. Applicable to Year 4 of Key Stage 2. Electricity. Colours may vary.

E8A58695

pack 10 **£1.39**

C Switch, Slide Type

A miniature double pole double throw slide switch suitable for panel mounting. Connections are by solder tags.

- Maximum rating: 250V a.c., 0.25A.
- Dimensions of body: 15 x 8 x 7mm.
- Fixing centres: 19mm.

E8A61309

pack 5 **£1.50**

D Push Button Switch

A miniature push button switch with a momentary push-to-make single pole action. Connections are by solder tags, and the switch may be mounted on a panel having a 7mm diameter hole via its threaded bush and nut. Maximum rating: 250V a.c., 0.5A. Button diameter: 6mm. Dimensions: L28 x Dia. 10mm.

E8A61281

pack 5 **£1.20**

E Electronic Buzzer, 6V D.C.

Transistorised type with 100mm flying leads. Frequency 420Hz approx. Current: 17mA max. Output: 83dB at 0.2m. Dimensions: 23 x 17 x 15mm.

E8A61268

each **£1.27**

F Electric Motors

A range of low voltage d.c. electric motors suitable for model making and similar applications. All have cylindrical bodies with either white metal or phosphor bronze bearings. Electrical connection is by solder tags on the rear end clips.

Voltage range	1.5-3V	3-6V
Torque g/cm	10.5	26.5
Dimensions l x d	26 X 20mm	31 x 24mm
Shaft diameter	2mm	2mm
Code	E8A61311	E8A61323
each	£0.56	£1.02
Code	E8R01996	E8R01997
pack 10	£5.39	£9.59

G Push Switch

Push Switch for BEK.

E8H30798

each **£7.39**

H Tumbler Switches

Pack of 15.

E8R05226

pack **£26.95**

I Clip Component Holder

Moulded base with 4mm sockets and crocodile clips to hold small resistors, capacitors, etc.

E8A61256

each **£2.29**

**CROSS REFERENCE**

For more BEK components see page 216



A



B



C



D



E



F



A 30 Piece Hex Set

A comprehensive 30 piece hex key set covering both metric and imperial keys down to small micro sizes which are not normally included in sets. Clean finished ends. Robust folding case. Contains metric standard length keys, 0.7mm - 10mm. Contains imperial long series keys, 0028in - 3/8in.

E8R06100

set £11.95

B Precision Screwdriver Kit

6 piece set contains 1.4mm, 1.8mm 2.3mm and 3mm slot and no.0 and no.1 crosspoint tip screwdrivers. Hardened blades. Chrome plated polished handles with serrated grip. Hexagonal revolving heads.

E8R06099

kit £4.19

C Side Cutters

Economy side cutters. Lap jointed, with return spring and PVC insulated handles. Overall length 115mm.

E8R05679

each £5.99

D Long Nose Pliers

Economy straight long nose pliers with serrated jaws and return spring. Lap jointed, with return spring and PVC insulated handles. Overall length 130mm.

E8R05680

each £5.99

E Automatic Wire Stripper

Self-adjusting to accommodate wires and cables of 0.5 to 6mm diameter. The special jaw design minimises the risk of damage to the wire. The stripped length is manually adjustable from 3 to 20mm and wire cutters are also incorporated. Length: 170mm.

E8A88109

each £8.39

F Wire, Extra Flexible, Single

Multistrand copper, PVC insulated. An extremely flexible wire, ideal for making up connecting test leads, to the users own specification. This is the same wire as used for our 4mm stockable plug leads and will carry a maximum of up to 10A. Supplied on drums of 25m.

E8F83119

Black

drum £7.49

E8F83121

Red

drum £7.49



A Antex XS-25 Tool Kit

Tool kit featuring an Antex XS25 burn-proof silicone cabled iron, a variety of tools, and a digital multimeter. The tip fitted to the iron is a long life, iron plated Antex 50 bit (2.3mm). Iron power is 25 watts. CE approved.

Includes: mini cutters, mini pliers, Screwdriver - flat blade, Screwdriver - cross, Tape measure 2m x 16mm, Auto-lock blade, Hex Allen Key set 1.5mm-6mm, Desoldering pump, 2 meter tube of lead-free solder, Flat pack metal soldering iron stand, XS25 230V iron with silicone cable, Spare soldering bit 50 2.3mm, Spare soldering bit 55 0.5mm, Digital multimeter with battery. Size: 285 x 180 x 50mm weight: 900g.

E8R06091

each £47.95

B G Clamp

Drop forged. Length 100mm.

E8R06357

each £9.95

C Precision Screwdriver Set

Set of 3 flatblade, and 3 crosspoint long shaft screwdrivers, ideal for reaching recessed screws in confined spaces. Handles are moulded plastic with colour coded heads. Chrome vanadium steel shafts. Flatblade sizes: 2.4 x 75mm, 3.0 x 100mm, 3.8 x 150mm. Crosspoint sizes: No.0 x 75mm, No.1 x 100mm, No.2 x 150mm.

E8R06092

set £3.59

D PAT Testing Kit

Designed for ease of use, the PAT Testing Kit is a perfect option for those with a small amount of appliances to test.

While other PAT testers can be quite complex, the UT527 makes testing easy. Simply connect up your appliance using the included leads, press the test button you need and the tester will either display PASS/FAIL to tell you if the appliance is safe or not.

This tester is suitable for testing both class I and class II appliances as well as power sockets, extension leads and IT equipment. It carries out all PAT procedures required by the IET Code of Practice including insulation resistance, earth continuity and more. Includes: PAT Tester, test lead, alligator clip and batteries.

Features:

- Manual PAT tester - doesn't display full testing results (PASS/FAIL indication only)
- Test class I, class II and cables
- Battery powered
- Lightweight
- One touch testing
- Simple to understand and follow
- Hard transit case
- Performs Earth Continuity, Insulation Resistance and Live / Neutral Checks for a/c, s/c and crossed testing

E8R06101

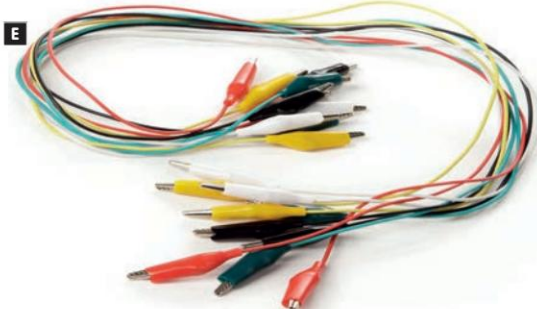
each £275.95

E Stanley Toolbox

A functional and robust toolbox having strong metal catches with a tote tray and parts organiser. Size: 20in long. Tools and equipment pictured not included.

E8R06198

each £22.95



A Stackable Plugs

The 4mm pin has a spring insert and the rear of the plug has a 4mm socket. The hexagonal bodies are of resilient moulded plastic and the wire is attached by means of a clamping screw in the bottom of the socket. Maximum current carrying capacity: 10A.

E8A59432	Black	each
E8A59444	Red	£0.74
E8A59456	Yellow	£0.72
		pack 10
E8R01998	Black	£5.39
E8R01999	Red	£5.39
E8R02068	Yellow	£5.39

B 5-Pin DIN plug lead

A 5-pin 180° DIN plug to plug lead. Connected pin 1, 2, 2, 3, 3 etc. Pure copper conductors. Length: 1.5m.

E8R06095	each	£2.39
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C BNC to 4mm Socket Adaptor

The BNC to 4mm adaptor connects two 4mm plugs to a BNC socket.

E8R05704	each	£9.59
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D Plug In PSU 5V 2A

This 5V 4A regulated plug-top power supply is suitable for the Unilab LED range, and data loggers.

E8R06093	each	£11.95
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E Crocodile Lead Set

An essential resource for any student building circuits, these make connecting components easy and safe. Applicable to Year 4 of Key stage 2: Electricity. The set consists of ten leads in five assorted colours, each with a plastic sleeved crocodile clip at both ends. Length of leads: 360mm.

E8A59389	set	£1.99
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F Plug Leads, Safety Type with Rigid Sleeve

A heavy-duty 4mm lead providing maximum operator safety by the incorporation of a rigid, non retractable insulating sleeve which completely encloses the plug pin.

- Maximum current rating: 32A
- Maximum working voltage: 1000V ac (tested to 4000V ac)
- Operating temperature range of lead insulation: -10 to +70°C
- Insulation material: PVC
- Nominal length: 1m

E8R05926	Black	each
E8R05927	Red	£8.39

G 2mm Stackable Plug Leads

Current carrying capacity 19A maximum.

	Colour	Length	each
E8R05922	Black	300mm	£2.59
E8R05923	Red	300mm	£2.59
E8R05924	Yellow	300mm	£2.59
E8R05928	Blue	300mm	£2.59

H 4mm Stackable Plug Leads

Current carrying capacity 19A maximum.

	Colour	Length	each
E8R05705	Black	100mm	£3.09
E8R05706	Red	100mm	£3.09
E8R05707	Yellow	100mm	£2.99
E8R05708	Black	250mm	£3.29
E8R05709	Red	250mm	£3.29
E8R05710	Yellow	250mm	£3.29
E8R05711	Black	500mm	£3.59
E8R05712	Red	500mm	£3.59
E8R05713	Yellow	500mm	£3.59
E8R05714	Black	750mm	£4.19
E8R05715	Red	750mm	£4.19

A Antex Soldering Iron

Soldering iron utilising double shaft construction principle to give near perfect insulation. Supplied with 2.3mm bit. Operating tip temp 390°C.

E8R05681 each **£25.95**

Soldering Iron Bit

E8R05684 0.5mm each **£5.99**

E8R05682 2.3mm each **£5.99**

E8R06356 3mm each **£5.99**

B Desoldering Pump

A high quality desoldering pump with double O ring washers for increased suction. The Teflon nozzle is removable so easy to clean or replace. Lightweight and easy to use. 200mm long and 20mm diameter.

E8R05687 each **£4.79**

C Omega Lead Free Solder

Omega lead-free solder is manufactured in the U.K. from 96% tin, 3.5% silver and 0.5% copper. It is rosin-free, halide-free and has a flux content of 3%. A fast flow solder, with good solderability, minimal clear residue and a melting point of 217°C.

E8R05689 18 SWG 250g reel **£39.95**

E8R05690 22 SWG 250g reel **£41.95**

D Soldering Iron Kit

Antex soldering kit which includes CS18W soldering iron with silicone rubber cable and 13A mains plug, bench stand, starter pack of solder and "how to solder" booklet.

E8R05688 kit **£35.95**

E Soldering Iron Stand

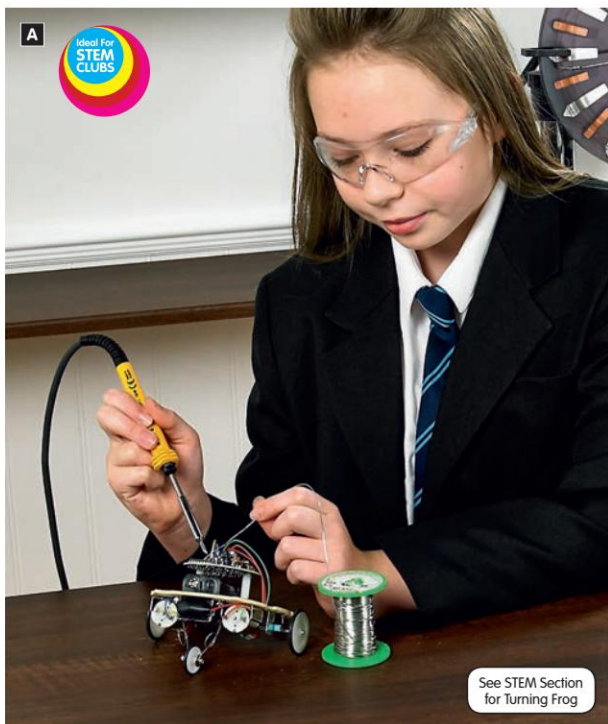
Strong chromium plated steel spring with a heat resistant plastic base. Integral sponge for cleaning bit. Ideal for soldering iron.

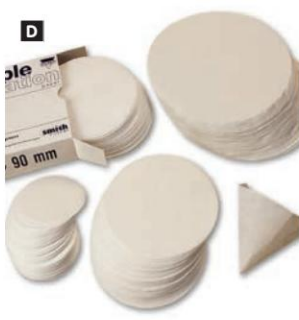
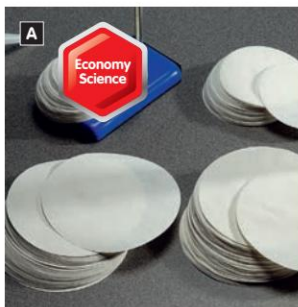
E8R05685 each **£7.19**

Soldering Stand Spare Sponge

Spare sponge for the Soldering Iron Stand.

E8R05686 each **£1.55**





A Elementary Filter Papers

Standard student filter papers suitable for basic requirements.

	Diameter	
E8H71685	90mm	box 100 £2.69
E8H71697	110mm	box 100 £2.99
E8H71703	125mm	box 100 £3.39
E8H71715	150mm	box 100 £4.59

B Student Grade Filter Papers

A general purpose paper wet-strengthened, made for school use. In boxes of 100 sheets.

	Diameter	
E8R02094	150mm	box 100 £12.95

C No. 1 Grade Filter Papers

A good quality paper with medium retention and flow rate. Boxes of 100 sheets.

- Filter speed: 150s per 100cm
- Retention: 11µm
- Wet burst: 1.7kPa

	Diameter	
E8A61979	110mm	box 100 £11.95
E8A61980	125mm	box 100 £11.95
E8A61992	150mm	box 100 £16.95

D Simple Filters

Ideal for the school laboratory.

	Diameter	
E8H71752	90mm	box 100 £2.49
E8H71764	110mm	box 100 £2.89
E8H71776	125mm	box 100 £3.59
E8H71788	150mm	box 100 £4.89

E Red Litmus Test Papers

Range pH 8-5, colour change. 10 books each with 20 strips.

E8A84815	box £3.39
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F Blue Litmus Test Papers

Range pH 8-5, colour change. 10 books each with 20 strips.

E8A84827	box £3.39
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G Neutral Litmus Test Papers

Colour change to red or neutral. 10 books each with 20 strips.

E8A84839	box £3.39
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H Cobalt Chloride Test Paper

Heat sensitive, colour change blue to pink with moisture. Depending upon humidity, papers may be pink on receipt and will need drying before use. Box of 10 books.

E8A84844	box £4.59
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I pH Indicator Paper

Range pH 1 to 14 in clear colour coded steps. Colour chart is on the side of the plastic dispenser. Available as either a reel of 5m of 6mm paper or a box of 10 books each of 20 leaves, 65 x 10mm.

E8G65605	reel £3.59
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pH 1-14 Universal Indicator Test Papers

Range pH 1 to 14 in clear colour coded steps. Colour chart is on the side of the plastic dispenser. Available as either a reel of 5m of 6mm paper or a box of 10 books each of 20 leaves, 65 x 10mm.

E8L07092	box £4.59
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J pH 1-11 Universal Indicator Test Papers

Range pH 1 to 11 in clear colour coded steps. Colour chart is on the side of the plastic dispenser. Box of 10 books with 20 strips.

E8A84803	box £4.19
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A Womens Coat

Designed to be slightly shorter in length to increase ease of movement during wear. Features includes and concealed stud front, long sleeves, 2 hip pockets and 1 chest pocket. 67% polyester/33% cotton. Machine washable and industrially launderable. Length 92cm. Available in Small (91cm), Medium (96cm) and Large (101-106cm). When ordering please state code plus A for Small, B for medium and C for Large.

Direct Delivery – up to 10 days

EBR05413A	Small	White	each £24.95
EBR05413B	Medium	White	each £24.95
EBR05413C	Large	White	each £24.95

B Men's Polycotton Coat

Concealed stud front, three patch pockets and centre back vent. Length: 100cm. Available in three chest sizes.

EBR03169	96cm	each £15.95
EBR03167	108cm	each £15.95
EBR03168	124cm	each £15.95

C Grabbit™ Hand Mitt

Protect your hand from hot or cold labware. This silicone rubber mitt is designed to comfortably fit your hand, has a studded, oversized surface for secure grip. Will withstand temperatures from -70 to 500°F (-57 to 260°C)

EBR04579	each £11.95
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D Hand Protectors, Silicone Rubber

Silicone rubber grippers for safe handling of hot beakers, flasks and test tubes. They will withstand temperatures of up to 250°C and are also excellent for handling cold objects down to -57°C. Contact surfaces are well studded for a positive grip.

EBA79406	each £55.95
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E Men's Polycotton Coat

Concealed stud front with three patch pockets and a centre back vent. Length: 100cm, chest size: small 96cm.

Direct Delivery – up to 10 days

EBR05735	each £16.95
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F Disposable Aprons

Polythene. 66 x 107cm. Available in white or blue. Dispenser pack of 100.

EBR05238	Blue	pack £4.79
EBR05237	White	pack £4.79

G Respirators

These disposable Respirators are tested to European Standard EN149:2001 and are classified by three filtration levels, ie how much of the airborne hazard is filtered by the mask.

Shaped for better fitting and clear vision, valved for low breathing resistance, low CO₂ and heat/moisture build-up and added user comfort, ideal low risk hazards such as non-toxic solid and liquid aerosols.

EBR06094	pack 10 £10.95
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H Tork® Wiping Paper Plus

This multipurpose wiping paper handles most wiping tasks and is ideal for mopping up liquids. Suitable for hand wiping and is food contact approved. 2 Ply, Roll length 157m. Supplied in a case of 6, blue.

EBR06106	case £27.95
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A Powder Free Vinyl Disposable Gloves

Vinyl, powder free glove. Completely vegetable protein free. Ambidextrous. Suitable for food handling, laboratories and clinics. Pack of 100 medium gloves in handy dispenser box.

EBR03170 box **£5.39**

B Powder Free Latex Disposable Gloves

Hand hugging latex provides maximum dexterity, sensitivity and comfort. Made completely from natural rubber. Powder Free. Ambidextrous. Suitable for laboratories, food handling and medical use. Pack of 100 medium sized gloves in handy dispenser box.

EBR03171 box **£6.89**

C Powdered Vinyl Disposable Gloves

Clear vinyl disposable gloves, strong enough to be re-used in some applications. Corn starch powdering on inside of glove and a soft sensitive formulation for feel and fit. Suitable for food handling, laboratories and clinics. Pack of 100 gloves in handy dispenser box.

EBR03172 box **£4.29**

D Powdered Latex Disposable Gloves

Hand hugging latex provides maximum dexterity, sensitivity and comfort. Made completely from natural rubber. Corn starch powdering on inside of glove eases donning and absorbs perspiration. Ambidextrous. Suitable for laboratories, food handling and medical use. Pack of 100 medium sized gloves in handy dispenser box.

EBR03173 box **£5.99**

E Blue Powder Free Nitrile Disposable Gloves

Developed to give combined sensitivity and strength. Approved for use by the food industry. Colour: blue. Pack 200.

EBR05275 Small box **£13.95**

EBR05276 Medium box **£13.95**

EBR05277 Large box **£13.95**

F Gloves, Leather

Gauntlet style gloves designed to provide protection for the hand and forearm against intermittent exposure to heat. Overall length: 350mm. Colours may vary.

EBA79510 pair **£6.79**

G Rubber Gloves

General purpose medium weight gloves with raised surface pattern for excellent wet grip.

EBA79492 pair **£0.83**



**bolle**

Bollé Safety have been providing the highest quality protection for more than 100 years. Their eyewear provide effective protection solutions that are reliable, suitable for lab work and comply with the most stringent European Standards. All Bollé safety spectacles benefit from the unique Bollé polycarbonate lens expertise guaranteeing class 1 optical performance, quartz anti scratch coatings and 100% protection against all UV rays.

**A Bollé B-Line Safety Goggles**

- Low energy impact, resists a 6mm, 0.86g ball at 45m/s
- Adjustable strap
- Anti-fog

E8R06212

E8R06344

each £3.59

pack 10 £31.95

B Bollé Overlight Goggles

Compact and attractive, they guarantee maximum safety for all, including wearers of prescription glasses.

- Pivoting temples
- Anti-scratch/anti-fog
- 25g

E8R06201

Adult

pack 10 £38.95

C Bollé Bandido Spectacles

- Made entirely of highly-resistant polycarbonate
- Wrap-around fit
- Supplied with adjustable cord
- Anti-scratch/anti-fog
- 28g

E8R06203

pack 10 £43.95



A



B



C



D



bolle

SAFETY

Our new range of Bolle Safety eye wear offer technicians and students reliable protection conforming to the latest standards.

A Bollé Atom Goggles

Compact, lightweight and extremely comfortable thanks to its modular thermo plastic rubber frame, the Atom goggles offer enhanced protection.

- Very compact and comfortable
- Thermo plastic rubber
- Overflow chute for liquids
- Ball-pivot
- Adjustable strap
- Fits over prescription glasses
- 74g

EBR06204

pack 5 £47.95

B Bollé Slam Clear Spectacles

Stylish and easy-to-wear. The slam model provides protection at all times while offering unbeatable comfort.

- Wrap-around fit
- All-round vision
- Comfortable straight temples
- Adjustable cord included
- Anti-scratch/anti-fog
- 23g

EBR06200

pack 10 £53.95

C Bollé Silium Spectacles

Combining the high-tech nature of metal with subtle design.

- Metal frame
- 160% flex temples
- Non-slip tipgrip temples
- Adjustable non-slip pads
- Anti-scratch/anti-fog
- 34g

EBR06199

pack 10 £93.95

D Bollé B-Line Spectacle Covers

The B-Line spectacles filter ultraviolet radiation, and are particularly recommended during activities where the source of ultraviolet radiation is predominant, such as mercury vapor lamps, actinic or germicides. Low energy impact, resists a 6mm, 0.86g ball at 45m/s. Suitable for use with high speed particles at extreme temperatures.

EBR06207

pack 10 £21.95

All
New

Exceptional
Science

Everyday
Science

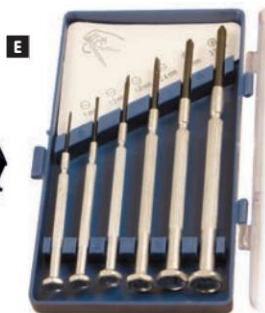
Practical
Information

SAFETY SPECTACLES

Safety Spectacles must fit the wearer correctly. Our range includes both Junior and Adult size spectacles as well as shields with adjustable arms for a closer fit.



bolle.



A Bolle Spectacles Dispenser

The safety spectacle dispenser enables your students to obtain quickly and conveniently. Very handy and strong, the metal box has been designed to be wall mounted (all fixings supplied) with the dispensing of safety spectacles made easy thanks to the flip up door. Includes 10 pairs of different style safety spectacles. Size: H335 x W185 x D135mm.

E8R06209

set £73.95

B Bolle Viper Spectacles

- Ultra modern, lightweight, sports style wrap
- Close fitting protection
- Panoramic vision
- Polycarbonate lens
- Anti scratch
- Adjustable side arms and integral side shields
- Supplied with a sports neck cord

E8R06314

pack 10 £119.95

C Bolle Pilot Goggles

The flexible frame is highly adaptable for unbeatable comfort.

- Very flexible frame
- Adjustable strap
- Fits over prescription glasses
- Anti-static
- 84g

E8R06206

each £12.95

D Bolle Face Shield

Medium energy impact, resists a 6mm, 0.86g ball at 120m/s.

E8R06205

each £8.39

E Precision Screwdriver Kit

6 piece set contains 1.4mm, 1.8mm 2.3mm and 3mm slot and no.0 and no.1 crosspoint tip screwdrivers. Hardened blades. Chrome plated polished handles with serrated grip. Hexagonal revolving heads.

E8R06099

kit £4.19

F Lens Cleaning Tissues

For non-abrasive cleaning of delicate optical surfaces. Unit-free paper, in sheets of 100 x 150mm size. Contains 20 books of 100 sheets.

E8R05591

pack £59.95

Passive Welding Shade 9

The passive welding filter, shade 9 (as suggested by CLEAPSS), can be used to protect your eyes when viewing bright chemical reactions, for example burning magnesium. This filter is EN379 compliant.

E8R06334

pack 10 £18.95



A

B



C



D



E



A Philip Harris Spill Pack

The Philip Harris Spill Pack is made up of six containers, each with enough absorbent material to absorb a spillage of up to 500cm³, the maximum volume recommended for storage in a laboratory. In addition to the absorbent material, two packets of soda ash are provided so that acid spills, once absorbed and collected, can be neutralised and made safe for disposal. Ten stout polythene bags are also provided so that after treatment any spillage can be collected and contained prior to disposal by appropriate means. Full instructions are also provided.

E8A80196

pack £58.95

B Sharps Containers

This 1 litre container is leakproof, puncture resistant and fully labelled. It comes complete with remover, handle and locking closure. Conforms to BS 7320.

E8H63378

each £7.19

C School Haversack First Aid Kit

Compact and comprehensive haversack kit comprises 8 internal compartments for easy location of the products you need. Contains a first aid guidance leaflet, 20 x assorted washproof plasters, 20 x fabric plasters, 6 x triangular dressings, 4 x eye pads with bandage, 9 x medium wound dressings, 3 x large wound dressings, microporous tape, instant cold pack, 3 x burn cool sachets, 2 x life aid resuscitators, emergency foil blanket, 5 x eye wash pods (20ml), 2 x eye wash bottles (150ml), self seal waste bags, a pair of scissors, a pair of tuckit scissors, 12 x safety pins, 10 x alcohol free wipes and 1 x pair of latex disposable gloves.

E8R05273

kit £37.95

D HSE First Aid Kit

A first aid kit supplied in a sturdy plastic box, suitable for up to twenty people.

Kit contains:

- 40 waterproof plasters.
- 10 alcohol free antiseptic wipes
- 3 HSE dressings 18 x 18cm
- 9 HSE dressings 12 x 12cm
- 4 No.16 eye patches
- 12 Safety pins
- 6 individually wrapped bandages
- 2 pairs of disposable polythene gloves
- 1 guidance leaflet.

E8H00277

each £18.95

E Rapid Response Pack

Personal kit to minimise delay in rendering first aid. Contains resuscitation shield, non-woven triangular bandage, medium dressing 120 x 120mm, 20 x waterproof plasters, stainless steel scissors, 1 x pair of vinyl disposable gloves, 4 x alcohol free antiseptic wipes, pen torch and a zip pouch with belt strap.

E8R05274

pack £9.59



A



A Emergency Burns Kit

Contents: Guidance leaflet, burn shield dressing 200 x 200mm, 2 x burn shield dressing 100 x 100mm, 2 x burn dressings DIN specification 60 x 80mm, 8 x burn blot sochets, 1 x 7.5cm x 4cm conforming bandage, 1 x waterjet burn dressing, safety pins, 1 pair of lukut scissors, 2 pairs of vinyl disposable gloves. Case dimensions: H275 x W270 x D95mm.

E8R03228 each **£31.95**

B Fixed Eyewash Station

Complete with 2 x 500ml bottles of eyewash, 2 eye pads and a shatterproof mirror. Clear instruction panel includes correct use of eyewash.

E8R03227 each **£19.95**

C Eyewash Pod Station

Wall mounted eyewash pod station. Contents: shatterproof mirror, 25 x eyewash pods. Size H250 x W325 x D25mm.

E8R03226 each **£16.95**

D Fire Blanket

Essential blanket in most fire safety strategies, single piece design for long lasting service. Hinged lid for easy extraction. Kitemark certified to BSEN 1869:199. 1.2 x 1.2m.

E8R05269 each **£21.95**

B



C



D





Double Eye Showers

Eye showers with two 45° angled heads, including a 1.5m inlet hose. Trigger operated including a built-in check valve and FLOWFIX for regulation of water flow (4 l/min). Easy to clean spray head with anti-imescale design and stick-on dust cap. Weight: 0.2kg. Shower head height: 245mm, wall bracket length: 150mm.

A Table Mounted

EBR06078 each **£203.95**

B Wall Mounted

EBR06077 each **£203.95**

C Autoclave Tape

An adhesive tape used in autoclaving to indicate whether a specific temperature has been reached. Autoclave tape works by stripes appearing after exposure to temperatures commonly used in sterilisation processes, typically 121°C in a steam autoclave. Size: 55 metres x 18mm roll.

EBR06055 roll **£6.59**

D Caution Radioactive Material Tape

EBR06079 66 metres roll **£7.19**

E Explosives Tape

EBR06080 66 metres roll **£7.19**

F Flammable Tape

EBR06081 66 metres roll **£7.19**

G Oxidising Tape

EBR06082 66 metres roll **£7.19**

H Gases Tape

EBR06083 66 metres roll **£7.19**

I Corrosive Agents Tape

EBR06084 66 metres roll **£7.19**

J Toxicity Tape CAT 1-3

EBR06085 66 metres roll **£7.19**

K Toxicity Tape CAT 4

EBR06086 66 metres roll **£7.19**

L Carcinogenic Tape

EBR06087 66 metres roll **£7.19**

M Environment Tape

EBR06088 66 metres roll **£7.19**

N Eye Emergency Signs

Clear location signs allows easy recognition of the designated eye wash stations. Sign materials are detailed alongside sizes i.e. self-adhesive vinyl: S/A and rigid PVC: PVC.

Direct Delivery - up to 2 weeks

EBR05270 150 x 150mm, S/A each **£2.99**

EBR05268 150 x 150mm, PVC each **£5.99**

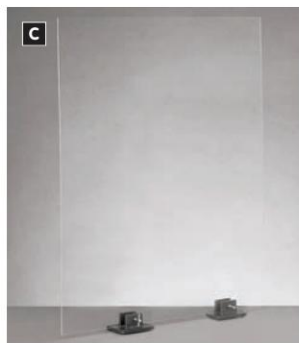
EBR05272 200 x 150mm, S/A each **£4.19**

EBR05271 200 x 150mm, PVC each **£7.19**



Philip Harris offer a table and wall mounted eye shower, both of which fully conform to EN15154-2 and AN51Z358.1





A Folding Safety Screen

An easily adjustable safety screen with excellent clarity. Rounded corners to prevent accidental injury caused by sharp points. The screen stands 600mm high, with 3 panels that can be angled to suit.

Direct Delivery – up to 4 weeks

E8F78927

each **£95.95**

B Fixed Safety Screen

A robust and stable safety screen with excellent clarity. Rounded corners to prevent accidental injury caused by sharp points. The screen stands 600mm high, with three fixed-angle panels.

E8R05691

each **£83.95**

C Protective Screen

Large, transparent, Perspex sheet, quickly and easily set-up using clamps or channel bases. Dimensions: 750 x 600 x 3mm. Channel bases NOT supplied.

E8A80020

each **£17.95**

D Laboratory Jack

Strong, stable support for laboratory equipment. The jacks have screw-operated scissor-action mechanism, the top plate having a threaded hole for a laboratory rod.

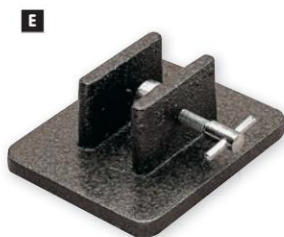
SPECIFICATION		
CODE	E8A82144	E8L75590
Plate size	160 x 130mm	200 x 200mm
Closed height	60mm	57mm
Max height	275mm	275mm
Max load	60kg	80kg
EACH	£66.95	£92.95

E Channel Base

Slotted base, steel with matt finish. Accepts flat objects up to 13mm thickness. Dimensions: 102 x 82mm. Mass: 600g.

E8R03304

each **£7.19**





A Angled End Spatula

Angled end, rounded.
Stainless steel, length: 100mm, width: 7mm.

E8A81619 each **£0.54**

E8R04178 pack 10 **£4.49**

B Chattaways Spatula

One end flat, other end bent up, polished nickel, length: 200mm.

E8A81620 each **£2.49**

E8R04179 pack 10 **£21.95**

C Raised Centre Spatula (Nuffield)

Raised centre section, one end flat and bent up and other end formed into a scoop.
Stainless steel, length: 140mm.

E8A81632 each **£1.32**

E8R04180 pack 10 **£5.99**

D Spoon Form Spatula

One end flat, and the other end spoon form. Stainless steel. 210mm.

E8A81656 each **£2.49**

E8R04182 pack 10 **£21.95**

E Trowel Spatula

Double ended with trowel-shaped scoops for handling large quantities of material. Stainless steel.
Size: 175 x 15mm, length x mean width.

E8A81679 each **£1.50**

E8R04181 pack 10 **£11.95**

F Mild Steel Rods

Plated mild steel, to fit bases above. Screwed 10 x 1.5mm metric thread.

	Rods	each
E8A82041	500 x 10mm	£3.99
E8A82053	600 x 12.5mm	£4.39
E8A82065	750 x 12.5mm	£5.99
E8A82077	1000 x 12.5mm	£7.79 pack 10
E8R01877	600 x 12.5mm	£45.95

G Retort Stand Bases

Steel base with tapped hole, (10 x 1.5mm metric thread) in the centre of one short side. Finished in blue and fitted with rubber feet.

	Bases	each
E8A82004	160 x 100mm	£6.69
E8A82016	200 x 125mm	£10.95
E8A82028	250 x 160mm	£16.95

H Economy Stand Rod

610mm length, 13mm diameter with narrower 9.5mm thread to assure right angled, upright fit on bases. A through-hole is positioned above the shoulder for easy tightening of the rod with a tommy bar or screwdriver (not supplied).

E8L32309 pack 5 **£12.95**

I Scoop

18cm, Round Form.

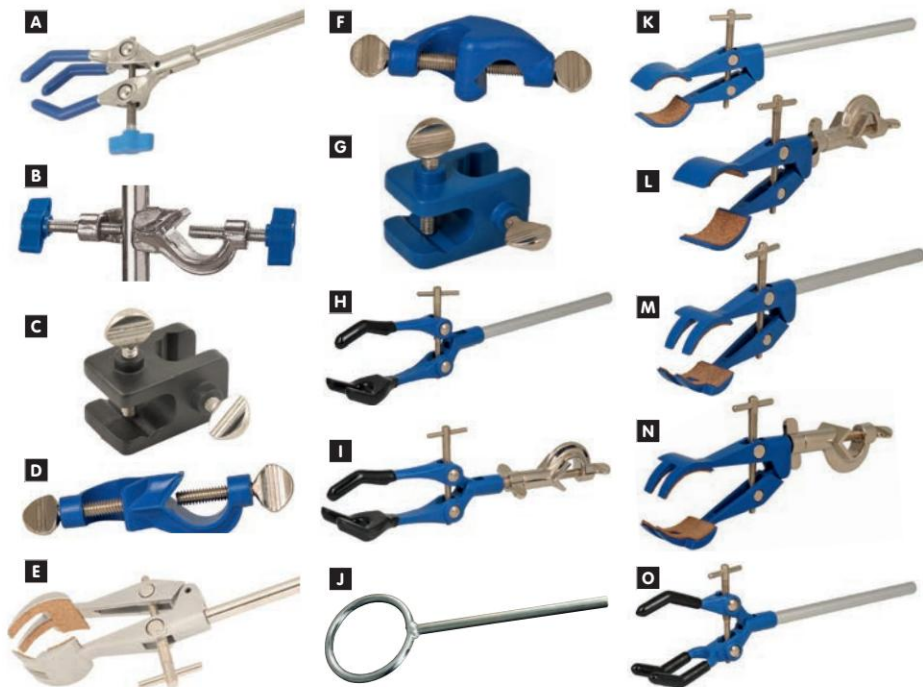
E8R05991 each **£3.59**

J Spatula 200mm

Moulded strong tapered spatulas with chamfered ends. Virtually unbreakable in normal use and retain shape after flexing. Good chemical and heat resistance. Autoclavable at 121°C.

E8R06090 pack 10 **£28.95**





	Code	Type	Description	Pack Size	Price
A	E8A82156 E8R01883	Diecast Jaws Clamp	Rubber lined, with tommy-bar screw-through swivels. 135mm cast alloy rod. Length: 250mm, jaw: 90mm.	each pack 5	£7.79 £35.95
B	E8A82181 E8R01880	Boss	Cast alloy with 2 right angled slots, takes rods up to 16mm diameter. Size: L120 x D30mm.	each pack 5	£2.99 £9.59
C	E8A82193 E8R01881	Square Boss	Diecast alloy, accepts rods up to 16.5mm diameter at right angles. Size: 30 x 30 x 50mm.	each pack 5	£6.59 £17.95
D	E8L32268	Boss	Diecast alloy body with plated thumb screws. Two v-shaped grooves at right angles to each other.	pack 5	£12.95
E	E8L32279	Four Pronged Clamp	Diecast aluminium alloy. Holds objects of diameter 6 to 95mm.	pack 5	£15.95
F	E8R06142	Bosshhead - Heavy Duty	Powder Coated Bosshhead for rods up to 16mm.	each	£2.99
G	E8R06143	Bosshhead - Square Head	Die Cast Alloy Bosshhead, up to 15mm Rods. Holds rods 90 degrees to one another.	each	£2.99
H	E8R06146	Clamp - Three Finger	Vinyl coated, opening 8.5cm. 14cm Stainless Steel Connecting Rod. 10mm diameter rod.	each	£5.99
I	E8R06148	Clamp - Three Finger with Bosshhead	Vinyl Coated, opening 8.5cm. Swivel between Clamp and Bosshhead. Holds rod up to 18mm.	each	£9.59
J	E8L75644	Mild Steel Ring	With welded joints, plain stem diameter 8mm, length 140mm, internal diameter 55mm.	each	£5.99
K	E8R06149	Clamp - Two Prong Cork Lined	Corked Lined, 11cm maximum opening. Rod: 10mm diameter, length 14cm.	each	£7.19
L	E8R06150	Clamp - Two Prong Cork Lined Bosshhead	Cork Lined Clamp with swivel Bosshhead, maximum opening 11cm. Holds rods upto 18mm.	each	£8.39
M	E8R06144	Clamp - Four Prong Cork Lined	Cork Lined, 10.5cm maximum opening. Rod: Length 14cm, diameter 10mm.	each	£5.99
N	E8R06145	Clamp - Four Prong Cork Lined Bosshhead	Cork Lined, with powder coated zinc alloy. 10.5cm maximum opening. Holds rods upto 18mm.	each	£8.39
O	E8R06147	Clamp - Three Finger Long	Vinyl Coated, 8.5cm maximum opening. Rod: Length 14cm, diameter 10mm.	each	£5.99



Practical Information

RED RUBBER

Best quality red rubber. Shore hardness in range 46-55. Bottom diameter moulded on top face. Holes 5mm dia. All BS2775: 1987

Helpful Hint

PLEASE NOTE:

Extreme care must be used when inserting glass into the holes in rubber stoppers. The procedure should only be carried out by trained personnel. If in doubt consult your safety advisor.

Choosing the right stopper for your glassware				
G1	Pyrex HD NM Conical (50mL)	Test tubes (18mm diameter)		
G2	Pyrex NM Conical (50-100mL)	Pyrex Flat/Round Bottom NM Flask (100mL)		
G3	Test tubes (24-25mm diameter)			
G4	Pyrex HD NM Conical (125mL)	Simax NM flasks (50-100mL)		
G5	Pyrex heavy Wall Filter flask (100mL)	Simax WM flasks (100mL)		
G6	Economy NM flasks (100mL)	Pyrex HD NM Conical (500mL)	Pyrex Flat/Round Bottom NM Flask (250-500mL)	Pyrex Conical WM Flask (100mL)
G7	Economy NM flasks (250mL)	Pyrex NM Conical (250-500mL)	Simax Side arm (250mL)	
G8	Pyrex HD NM Conical (1000mL)	Pyrex Flat/Round Bottom NM Flask (1000mL)	Simax NM flasks (250-500mL)	Simax WM flasks (250mL)

†	Bottom Diameter	Top Diameter	Length	Solid	Pack size	Price	One hole	Pack size	Price	Two hole	Pack size	Price			
G1	13mm	16mm	24mm	E8A82569	pack 10	£1.79	E8A82855	pack 10	£1.89						
	15mm	18mm	24mm	E8A82570	pack 10	£2.09									
G2	17mm	20.5mm	26mm	E8A82582	pack 10	£3.09	E8A82879	pack 10	£3.19						
G3	19mm	22.5mm	28mm	E8A82594	pack 10	£3.39							E8A82880	pack 10	£3.39
G4	21mm	24.5mm	28mm	E8A82600	pack 10	£3.39	E8A82892	pack 10	£3.39						
G5	23mm	26.5mm	28mm	E8A82612	pack 10	£4.79									
G6	29mm	33mm	32mm	E8A82648	pack 10	£7.79	E8A82934	pack 10	£5.99						
G7	31mm	36mm	35mm	E8A82659	pack 10	£9.59							E8A82946	pack 10	£9.59
G8	33mm	38.5mm	39mm	E8A82661	pack 10	£11.95	E8A82958	pack 10	£9.95						

**A Glass Cutter**

Glass tubing cutter, up to an outer diameter of 40mm.

E8R06089 each **£17.95****B Borosilicate Capillary Tubing**

In boxes of ten, 0.5m lengths.

	O.D.	Bore	pack 10
E8A89576	6mm	0.8mm	£19.95

C Borosilicate Glass Tubing

Light wall, borosilicate glass, heat and chemical resisting. Softening point 810-830°C. Supplied in packs of 0.5m lengths.

	O.D.	Bore	pack 30
E8A89485	5mm	3.4mm	£18.95
E8A89497	6mm	4mm	£19.95

D Rigid Clear Acrylic Tubing

Strong, rigid, transparent. Bore: 24mm, external diameter: 30mm.

E8A89606 1m length each **£13.95****E Transparent PVC Tubing**

Resistant to acids, alkalis and continuous heat up to 60°C. May be autoclaved up to 125°C, returning to its original state on cooling.

	Bore	Wall	per metre
E8A89692	3mm	0.75mm	£0.30
E8A89709	5mm	1.5mm	£0.42
E8A89710	6.5mm	1.5mm	£0.48
E8A89722	8mm	1.5mm	£1.08

F Red Rubber Tubing

To BS 2775.

	Bore	Wall	per metre
E8A89631	3mm	0.75mm	£1.42
E8A89643	5mm	1.5mm	£1.99
E8A89655	6.5mm	1.5mm	£1.32
E8A89667*	8mm	2mm	£2.39
E8A89679	10mm	2mm	£2.99
E8A89680	12.5mm	2.25mm	£4.19

*is suitable for burners with inlet tube of o.d. 9-10mm.

G Heavy Wall Red Rubber Tubing

For pressure and vacuum work.

	Bore	Wall	per metre
E8A89771	5mm	4.0mm	£3.59
E8A89801	8mm	5.5mm	£9.89

H Black Neoprene Rubber Tubing (Butt Ended)

For laboratory burners. Internal diameter: 5mm, external diameter: 8mm.

	Length	each
E8A89813	450mm	£5.39
E8A89825	600mm	£5.39
E8A89837	900mm	£4.79

I Neoprene Burner Tubing

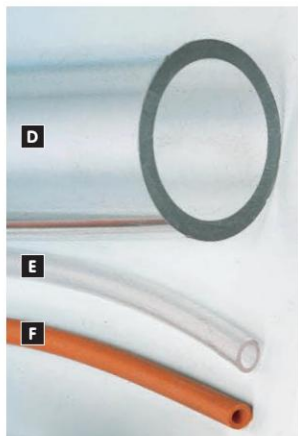
For use with butane/propane gas burners. Neoprene tubing has increased life expectancy compared to natural rubber. Bore: 8mm. Wall: 2mm.

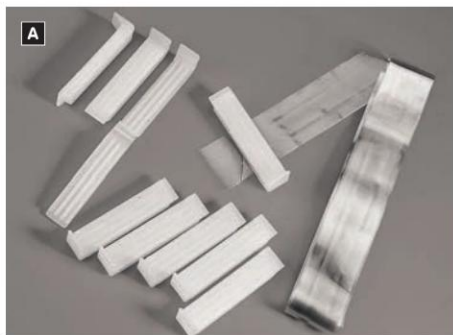
E8A89849 metre **£4.19****J Silicone Rubber Tubing**

Natural colour. Bore: 4.8mm. Wall: 1.6mm. Supplied in 1 metre lengths.

E8A89874 metre **£5.99****K Translucent Seamless Latex Tubing**

Very flexible, particularly suitable for connections to glass. To BS 2775. Bore: 5mm. Wall: 1.5mm.

E8A89898 metre **£9.59**



A Visking Tubing Clips

Visking tubing clips to close tubing up to 29mm inflated diameter.

E8A58658

pack 10 £29.95

B Visking Tubing

A cellulose based, selectively permeable material, in tube form, which can be used to demonstrate osmosis and dialysis separation techniques. Retains molecules of molecular mass; 12-14 x 10. 14mm diameter.

	Diameter	Length	each
E8A90463	14mm	5m	£24.95
E8A90475	14mm	30m	£44.95

C Hofmann Clips

Nickel-plated brass. Hinged side bar for fitting and removal without access to ends of tubing.

	Maximum opening	Internal width	each
E8A58610	12mm	20mm	£3.09
E8A58622	12mm	25mm	£3.69

D Tubing Adaptor Unequal Diameters

To connect tubing of different internal diameters. Riffled limbs provide secure attachment. Suitable for tubing with internal diameters: 4 to 7mm and 7 to 12mm.

	Nominal o.d. mm	Crest o.d. min/max	Bore, mm	each
E8A90098	3 - 7	4.5 - 8.2	1.6	
	6 - 11	8.0 - 11.8	4.6	£1.79

E Tubing Connectors Y Shape

Polypropylene, riffled end for rubber tubing. May be autoclaved. To fit tubing nominal bore.

	Diameter	each
E8A89990	4mm	£1.99
E8A90001	6mm	£2.09

F Tubing Connectors T Shape

Polypropylene, riffled end for rubber tubing. May be autoclaved. To fit tubing nominal bore.

	Diameter	each
E8A89953	4mm	£1.45
E8A89977	8mm	£2.19
		pack 10
E8R06076	6 - 7mm	£21.95

**A****B**Direct
Delivery**A Cork Borers**

Nickel-plated brass; variety of sizes of tubes each with cutting edge at bottom and handle at top. Set complete with cleaning rod.

E8A83550 set 6 **£33.95**

E8A83562 set 12 **£65.95**

B Foam Plastic Stoppers

Porous, to allow air to diffuse in and out of specimen tubes. Autoclavable. Size: D30 x L30mm.

Direct Delivery – up to 10 days

E8A83537 pack 50 **£12.95**

**C****C Collecting Trays**

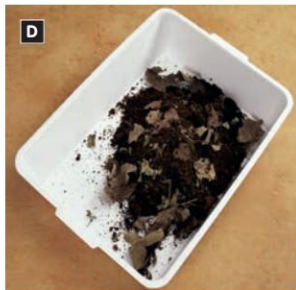
Sturdy, shallow polypropylene trays that can be used in the classroom for display purposes or outside for sorting and storing field samples etc.

Dimensions

E8A88687 L355 x W255 x D50mm each **£10.95**

E8A88699 L310 x W240 x D20mm each **£5.99**

E8A88705 L355 x W240 x D20mm each **£9.59**

**D****D Large Sorting Tray**

A large deep plastic sorting tray. Size: L440 x W320 x D90mm.

E8H48031 each **£6.29**

**E****E Airtight Polythene Storage Box**

Suitable for refrigeration. Capacity, 10cm³. Outside overall dimensions, L195 x W140 x D60mm.

E8A83732 each **£2.99**

F Circular Transparent Polystyrene Containers

Lightweight polystyrene container with a snap-on polythene lid. Supplied in packs of ten.

Capacity cm³ h x d, mm

E8A83793 20 32 x 32 pack **£12.95**

E8A83823 150 65 x 55 pack **£21.95**

**F****G****G Stainless Steel Mixing Bowl**

With satin outer and polished interior. 2.3 litre.

E8R04669 each **£4.39**



A Storage Trolley

White steel frame with twelve pairs of runners to accommodate either twelve shallow trays, six deep trays or a combination of either type. Supplied without trays. size: L715 x W412 x D850mm.

E8A89072

each £259.95

B Three Tier Apparatus Trolley

Fully welded, tubular end frame construction in stainless steel. Shelf heights 210mm, 520mm and 820mm from floor level. The shelves are fixed i.e. not removable for added stability and are supplied lipped edges up, lipped edges down are available on request. Maximum weight limit is 200kg uniform distributed load.

Size: L1060 x W460 x H900mm.

Direct Delivery – up to 2 weeks

E8R06316

each £263.95

C Two Tier Apparatus Trolley

Fully welded, tubular end frame construction in stainless steel. Shelf heights 219mm and 820mm from floor level. The shelves are fixed i.e. not removable for added stability and are supplied lipped edges up (lipped edges down are available on request). Maximum weight limit is 200kg uniform distributed load. Size: L1060 x W460 x H900mm. When used with care this trolley can carry approximately twenty SpaceSaver power supplies.

Direct Delivery – up to 2 weeks

E8R06315

each £257.95

E Ribbed Rubber Mat

Size: 1000 x 460mm, 3mm thick. Use with item B and C.

Direct Delivery – up to 2 weeks

E8R06317

each £47.95

F Kick Steps

Mobile step moves easily on castors. Once weight is applied castors retract giving firm safe base. Anti-slip liner on both steps. Steel construction. Height 400mm.

Direct Delivery – up to 2 weeks

E8R06107

Black

each £47.95



Gratnells

Everything in its place.

Gratnells international award-winning trays are BSI tested, fully recyclable and made for heavy educational use. They come in an exciting range of colours and four different heights, which means you can choose exactly the storage that suits your needs. All Gratnells trays fit standard school furniture so you can mix and match a whole range of different colours, lids and tray heights knowing they will all fit with the rest of your classroom storage.



Size: 312 x 427 x 300mm deep.

Size: 312 x 427 x 225mm deep.

Size: 312 x 427 x 150mm deep.

Size: 312 x 427 x 75mm deep.

Gratnells Block Colour Storage Trays

	A Jumbo	B Extra Deep	C Deep	D Shallow
Red	E8A88819	E8L76223	E8A88778	E8A88730
Yellow	E8A88821	E8L76235	E8A88789	E8A88742
Green	E8A88833	E8L76259	E8A88791	E8A88754
Blue	E8A88845	E8R05140	E8A88808	E8A88766
Orange	E8R05111	E8R04561	E8R04558	E8R04555
Purple	E8R05112	E8R04560	E8R04557	E8R04554
Light	E8R05139	E8R05114	E8R05138	E8R05137
Pink	E8R05136	E8R05113	E8R05135	E8R05134
Translucent	E8R04562	E8R04559	E8R04556	E8R04553

Gratnells Jelly Storage Trays

	E Jumbo	F Extra Deep	G Deep	H Shallow
Blueberry Jelly	E8R05122	E8R05115	E8R05121	E8R05120
Strawberry Jelly	E8R05152	E8R05117	E8R05127	E8R05126
Lemon Jelly	E8R05125	E8R05116	E8R05124	E8R05123
Kiwi Jelly	E8R05130	E8R05118	E8R05129	E8R05128
Grape Jelly	E8R05133	E8R05119	E8R05132	E8R05131
Each	£5.99	£4.79	£3.59	£2.39
10+	£5.89	£4.69	£3.49	£2.29



I Boxed Set

Includes 2 shallow trays each of blue, red, green, yellow and purple.

E8R05100

set £22.95

J Curricular Tray Pack

1 shallow tray of each National Curriculum colour. Pack of 10.

E8R04567

pack £23.95

Spares and Accessories

Gratnells Storage Tray Inserts

E8R05185	3 Compartments	pack 6 £23.95
E8R05186	4 Compartments	pack 6 £23.95
E8R05187	6 Compartments	pack 6 £23.95
E8R04566	8 Compartments	pack 6 £23.95

Lids For Gratnells Trays

E8A88857	each £1.99
E8R01889	pack 10 £19.95



Trays and Runners are Sold Separately
See Overleaf for the Trays.



Gratnells Frames and Trolleys

The Gratnells storage system is unique and designed for the organisation of all types of school equipment and the enormous range of science materials and equipment that need storing. Manufactured from square steel tubes with slots at 25mm intervals to take trays. The trolleys have 80mm castors and are ideal when transporting equipment around the room. Metal runners are required and sold separately but are adjustable and can accommodate our range of super-tough trays. Supplied flat packed for self assembly. Please note: trays and runners are sold separately.

Direct Delivery - up to 4 weeks

Gratnells

Everything in its place.

Gratnells Accessories

Tray Runners

Supplied in packs of 2 (for use with 1 tray).

E8R05183 Metal pair **£4.19**

A Plastic Dividers for Shallow Trays

For Gratnells shallow trays. Packs of 6.

E8R05185 3 Compartments pack 6 **£23.95**

E8R05186 4 Compartments pack 6 **£23.95**

E8R05187 6 Compartments pack 6 **£23.95**

E8R05188 8 Compartments pack 6 **£23.95**

B Foam Inserts for Safety Glasses

Holds up to 20 pairs of safety glasses.

E8R05203 each **£9.59**

C Foam Test Tube Holder

Holds 56 test tubes of 25mm diameter.

E8R05202 each **£9.59**

Gratnells Accessories

D Foam Insert for Calculators

E8R05201 Fits 7mm x 65mm. each **£9.59**

E Custom Shaped Foam Insert

E8R05204 each **£9.59**

Gratnells Frames

D Double Column Tall Frame

Can hold up to 34 shallow trays. Size W710 x D420 x H1850mm.

E8R05920 each **£263.95**

E Treble Column Tall Frame

Can hold up to 51 shallow trays. Size W1055 x D420 x H1850mm.

E8R05921 each **£311.95**

Gratnells Trolleys

F Single Column Trolley

Can hold up to 6 shallow trays. Supplied with heavy duty castors. Size: W370 x D420mm.

E8R05189 H725mm each **£143.95**

E8R05184 H850mm each **£143.95**

G Double Column Trolley

Can hold up to 12 shallow trays. Supplied with heavy duty castors. Size: W710 x D420mm.

E8R05177 H725mm each **£227.95**

E8R05180 H850mm each **£227.95**

H Treble Column Trolley

Can hold up to 18 shallow trays. Supplied with heavy duty castors. Size: W1055 x D420mm.

E8R05178 H725mm each **£239.95**

E8R05181 H850mm each **£239.95**

A



D



B



C



DELIVERY

Practical Information

The price quoted applies to the UK mainland only, excluding North Scotland and Highlands also overseas deliveries. Delivery to these areas can be arranged as a special order. Delivery will be to the nearest point of entry, not positioned on site. All goods must be checked for damages and/or shortage before signing. Normal deliveries will take place between 8am and 5pm Monday to Friday. A special delivery option to specify day or time can be arranged at extra cost. Delivery time is normally within 10 working days, however during periods of heavy demand this may increase.

A Hazardous Substance Cupboards

A range of cupboards to enable the separate storage and transportation of hazardous substances.

- No snag handles
- Adjustable spill-retaining galvanised shelves for superior spill management
- Integral liquid-tight sump encourages the correct handling of spills through the use of absorbents
- Welded integrated sump, angled lid to discourage article placement and a hasp and staple lock (padlock not supplied)

Direct Delivery – up to 10 days

	Dimensions (W x D x H)	Number of shelves	Number of doors	each
E8R05697	350 x 350 x 700mm	1	2	£159.95
E8R05692	900 x 460 x 700mm	1	2	£215.95
E8R05696	900 x 460 x 900mm	1	2	£239.95
E8R05693	900 x 460 x 1200mm	2	2	£299.95
E8R05694	900 x 460 x 1800mm	3	2	£359.95
E8R05695	1200 x 460 x 1800mm	3	2	£443.95

B Storage Cupboard, Radioactive Material

This is a stoutly built enamelled sheet-steel cupboard with a loured, lockable door bearing a standard international red and yellow warning plate. Two keys are provided for the lock. The rear wall of the cupboard carries two narrow steel shelves which ensure that any containers placed on them are at the maximum possible distance from the door. The dimensions of the cupboard are such that assuming a maximum stock of 30gCi in the form of Co60 is kept on the shelf, the dose rate at the surface of the door would be less than 0.5 mR/hr. A rectangular plastic tray is provided to contain any spillages. The cupboard is provided with small fixing holes so that it may be screwed to a wall. It is recommended that it is sited away from normally occupied areas and that its back is against or attached to a wall. Dimensions: 380 x 380 x 380mm. Tray: 310 x 240 x 20mm deep.

E8A84177

each £215.95

C Drugs And Poisons Cabinet

Lockable cabinet for the secure storage of scheduled drugs and poisons. Designed for wall mounting through special reinforced panels incorporated in the back. Features include sealed hinges and three adjustable shelves. Door hinges to right. Dimensions: W458 x D152 x H610mm.

E8A84049

each £245.95

D Acid and Alkali Cupboards

A range of cupboards to enable the separate storage and transportation of hazardous substances.

- No snag handles
- Adjustable spill-retaining galvanised shelves for superior spill management
- Integral liquid-tight sump encourages the correct handling of spills through the use of absorbents
- Welded integrated sump, angled lid to discourage article placement and a hasp and staple lock (padlock not supplied)

Direct Delivery – up to 10 days

	Dimensions (W x D x H)	Number of shelves	Number of doors	each
E8R05698	900 x 460 x 1800mm	3	2	£393.95
E8R05699	460 x 460 x 900mm	1	1	£203.95
E8R05700	900 x 460 x 700mm	1	2	£239.95
E8R05701	1200 x 460 x 1800mm	3	2	£479.95
E8R05702	900 x 460 x 900mm	1	2	£263.95
E8R05703	350 x 300 x 700mm	1	2	£173.95



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We offer an unrivalled service for the design, production, delivery and installation of laboratory furniture.

Our talented, experienced and knowledgeable design and project management team bring a wealth of experience from industrial to classroom laboratory projects alike.

Our manufacturing experience encompasses all the many varied materials used for worktops, doors, drawers and carcasses you may be certain our advice is both informed and impartial, ensuring optimum performance, longevity and a laboratory designed exclusively for you.

Design and Planning Service

- Project co-ordination of fixed and loose laboratory furniture
- Interior design and CAD planning
- 3D visualisation
- M&E co-ordination
- Budget management
- Specifications: material selection, product suitability and finish
- Creation of scheme mood boards
- Bespoke delivery and installations quotation available on request

Call for more information or to request a site visit.



Bespoke
design to
meet your
needs



A Classmates Coloured Rubber Bands

Assorted colours and sizes. 75g tub.

EBR04333 tub **£2.39**

B Paper Fasteners

Brass plated steel. Available in 3 sizes.

EBR04331 20mm box 200 **£3.19**

C Address Labels

Continuous rolls. Self-adhesive address labels. 242mm long. Comfort grip handle. Exceptional value for money. Suitable as dressmaking scissors.

EBR05915 89 x 36mm roll **£2.99**

EBR05617 80 x 50mm roll **£9.95**

D Soft Grip All Purpose Scissors

Premium quality at a value price. Stainless steel blades. 242mm long. Comfort grip handle. Exceptional value for money. Suitable as dressmaking scissors.

EBR03124 Right handed each **£3.69**

EBR05532 Left handed each **£3.69**

EBR05523 Left handed pack 5 **£15.95**

EBR04336 Right handed pack 10 **£30.95**

E Classmates Multi-Punched Pockets

A4 standard multi-punched pockets. Pack of 100.

EBR04341 pack 100 **£2.39**

F Graph Paper

Pack of 500 sheets of A4 loose leaf graph paper. 2, 10 and 20mm squared, unpunched and printed on both sides.

EBR04348 500 sheets (ream) **£7.19**

G Science Caption Stickers

38mm science mixed caption stickers. 5 sheets of 15 stickers.

EBR06075 pack **£4.49**

H Scientific Calculator

Natural text book display shows expressions as written and is ideal for children aged 11 and above. Comes with twin line 10 digit display, 249 functions with an easy menu, STAT data editor, table function and a slide-on plastic case. FX-85 is dual powered.

EBR05531 each **£13.95**

EBR05529 pack 10 **£119.95**

I Black 'n' Red Casebound Notebooks

Sturdy hardback covers, casebound. Sewn pages for tamper resistant durability. Smart red page ribbon for quick page referencing. Contains high quality 90gsm smooth 'Optik' Paper for minimal 'show-through' of notes

EBR06109 A4 pack 5 **£30.95**

J Index Book

Fully casebound and section sewn these A-Z thumb indexed notebooks come complete with 192 pages of 70gsm, faint ruled 8mm paper.

EBR06108 A4 each **£3.29**

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A Classmates Erasers

Soft erasers. Ideal for general classroom use. 32 x 25 x 7mm.

E8R04321 pack 48 **£4.19**

B Classmates Recycled Sticky Notes

Self-adhesive and repositionable notes. Super smooth quality finished paper. Eco-friendly water based glue. 75 x 75mm. 100 sheets per pad. Pack of 12 pads. Assorted colours.

E8R04318 pack 12 **£3.79**

C Classmates Highlighters

Universal ink, suitable for computer paper, fax and carbon copies. 5mm chisel tip. Assorted pack of 6 contains one of each colour as illustrated.

E8R04317 wallet 6 **£2.39**

D Classmates Barrel Sharpeners

Double hole for standard and jumbo/triangular pencils. Metal blade. Sharvings container.

E8R04320 pack 10 **£11.95**

E Classmates Mini Whiteboard Erasers

Easy grip wooden handle. Felt strips. Dry brush clean.

E8R04325 pack 30 **£12.95**

F Classmates Whiteboard Cleaner

Solvent-free water based whiteboard cleaning fluid. Low odour and non-toxic. Works as well as alcohol based fluids. 250ml pump action bottle.

E8R04324 each **£2.39**

G Classmates Correction Fluid

Multipurpose quick drying correction fluid for use on faxes, photocopies, typed and hand written documents. Contains no chlorinated hydro-carbons. 20ml bottles.

E8R04319 pack 10 **£2.99**

H Classmates Ballpoint

Coloured ventilated caps. Tub of 25 contains 10 black, 10 blue and 5 red.

E8R04315 tub 25 **£2.39**

I Classmates Recycled Permanent Markers

The barrels are made from recycled paper. The caps are made from eco-benign polypropylene. Quality ink. Low odour alcohol based ink. Assorted colours.

E8R04322 pack 4 **£3.09**

J Classmates Recycled Dry-wipe Markers

The barrel is made from recycled paper and the cap is made from eco-benign polypropylene. They contain quality strong coloured ink and come in 100% recycled packaging. The assorted packs contain black, blue, green and red.

E8R04323 pack 10 **£5.99**

K Classmates Handwriter

Hardwearing nylon, non-push through tip with ventilated cap. Over 2,500 metre writing life. Great value.

E8R04314 Black tub 40 **£9.59**

L Classmates Eraser Tipped Pencils

Eraser tipped pencils. Exceptional value for money. Hexagonal shaft - 8mm diameter. Quality robust pencils for school or office use. General purpose HB.

E8R05401 pack 144 **£11.95**



F Classmates Blue Label PVA

A multipurpose PVA adhesive recommended for children's use. CE certified and formulated to wash out of normal clothing.

E8R04350	180ml	pack 10	£8.39
E8R04351	600ml	pack 10	£13.95
E8R04290	5 litre refill	each	£5.99

G Sellotape® Original

Britain's No.1 sticky tape. Strong and extra sticky. Golden in colour but clear when applied. Easy to unwind and tear - no need for scissors. 66m reel has a core size of 75mm. 33m reel has a core size of 25mm.

E8R04301	18mm x 33m	pack 8	£7.19
E8R04302	18mm x 66m	pack 8	£10.95
E8R04303	24mm x 33m	pack 6	£5.99
E8R04304	24mm x 66m	pack 6	£8.69

H Sellotape® Super Clear

This premium super clear tape gives maximum clarity using the latest Super clear technology. It provides a seamless finish and is easy to tear meaning no more need for scissors. Allows for better control as it will not tangle easily. Ideal for everyday use as well as sticking card, paper and envelopes.

E8R04305	18mm x 25m	pack 8	£8.39
E8R04306	24mm x 50m	pack 6	£9.95

I Sellotape® Dispenser

This desk top dispenser with a sleek chrome finish features a non-slip rubber base for stability and is weighted for fast dispensing. The small can dispense rolls of tape up to 19mm wide and 33m long and the large for rolls of tape up to 25mm wide and 66m long. They can both dispense rolls with core sizes of 24mm and 18mm.

E8R04307	Small	each	£6.09
E8R04308	Large	each	£8.99

B Pritt Power

The strength and versatility of an all purpose glue in the convenient and easy to use format of a glue stick. Solvent free and washable, sets in 15 seconds. Sticks wood, felt, cardboard, fabric and many more materials. 19.5g

E8R05403	pack 12	£16.95
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C Classmates Glue Stick

Exceptional value for money. For use on paper and card. Dries clear. Washable, non-toxic and solvent-free. Repositionable for 1 minute after application. CE certified.

E8R04297	20g	pack 9	£3.79
E8R04298	20g	pack 100	£39.95
E8R04299	40g	pack 8	£4.79
E8R04300	40g	pack 100	£45.95

D Blu Tack Original

Clean and safe, easy to use with 1000s of uses. Blu Tack provides an alternative to drawing pins and sticky tapes and can be used for holding up posters, cards, paintings, decorations and much more. Can also be used for holding down model parts during construction or painting. Re-usable, clean, grease-free, safe and easy to use.

E8R05405	60g	pack 12	£9.59
E8R05404	120g	pack 12	£10.95

E Evo-Stik Epoxy Rapid

An extra strong long lasting adhesive. Will bond ceramics, wood, chipboard, glass, metal and most hard plastics. Easy to mix and sets in minutes. Blister card with 15ml tube of resin, 15ml tube of hardener and a spreader.

E8R04313	each	£5.09
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A Pritt Stick

Ideal for sticking paper, card and photographs. Made from 90% renewable ingredients. Solvent free, acid free, non-toxic and washable at 30°C. Airtight cartridge prevents stick from drying out.

Pack 34 with 3 FREE Power Pritt

E8R04294	43g	pack 34	£40.95
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E8R05402	22g	pack 24	£26.95
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E8R04291	43g	pack 24	£31.95
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Pack 100 with 4 FREE glue sticks

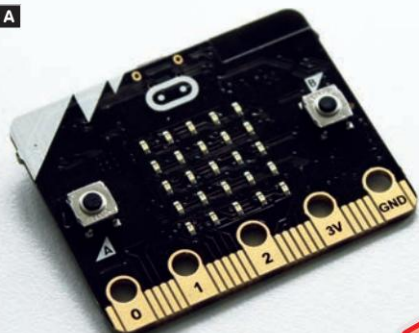
E8R04295	43g	pack 100	£113.95
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Pack 200 with 8 FREE glue sticks

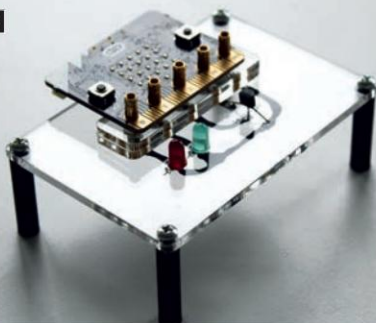
E8R04296	43g	pack 200	£215.95
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A



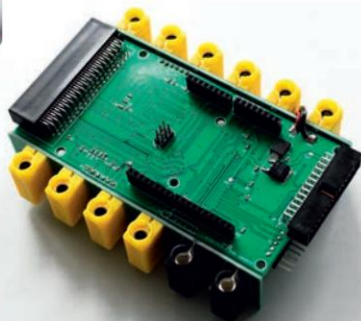
B



C



D



A BBC micro:bit

The BBC micro:bit provides an accessible introduction to coding, which enables anyone to learn how to code in a fun and exciting way. The possibilities for what you can create using the micro:bit are endless. You could make your own game, design an animation or even use it to create music. Anyone with any level of experience can use it from beginner to advanced programmer. It runs a very simple programming language called 'Touch Develop', which is aimed at the novice user and perfect for use in schools to teach the new computing curriculum. It is simple and enables students to begin coding straight away.

Features:

- 25 Red LED Matrix. These LEDs can be programmed individually to create displays.
- 2 Programmable Buttons. Think of each button as a switch for anything. Programme them to tell your phone to take an image using the Bluetooth connectivity or use them as inputs on the game you have designed are just a couple of ideas on how you can use them.
- Accelerometer. This can be programmed into a new game or maybe even used to design a pedometer.
- Compass. Create your own portable compass using the LED matrix. Programme the LED matrix to tell you which way is north.
- Bluetooth Connectivity. This connectivity to devices such as phones, tablets and laptops.
- 4mm Connectors. These connectors allow easy connection to the micro:bit by using 4mm banana plugs. (Available separately).
- Edge Connector. The edge connector enables you to connect more to the micro:bit. See the micro:bit docking station.

EBR06341

each **£13.95**

EBR06335

pack 10 **£133.95**

B Micro:bit CoderKits

This unique product has been designed to teach programming and basic electronics in a creative and fun way using the BBC micro:bit. It allows you to create basic electronic circuits without the need for cables and soldering by using a semi-conductive paint to link the components. Once the circuits have been made, use the BBC micro:bit and a bit of creativity to programme them to function in any way that you decide. CoderKits are suitable for all levels of programming experience, and are perfect for use in schools to teach the new computing curriculum.

All boards are reusable as the semi-conductive paint can be washed off with water, which also allows for connections to be made for simple mistakes.

Includes:

- 4 CoderKit Boards
- LED Traffic Lights
- Joystick
- Thermistor
- LDR
- Semi-Conductive Paint
- BBC micro:bit sold separately

EBR06337

each **£35.95**

C Play Music Through the BBC micro:bit Cable

This is exactly what it sounds like. This cable opens up the ability to make music through programming the BBC micro:bit. It has a simple 4mm banana plug connection to the micro:bit and a standard 3.5mm jack connection for connecting headphones or speakers.

It works by programming the micro:bit to turn the speaker on and off at a specified frequency to create a note. See the enclosed instructions manual that comes with the cable for the frequencies required to make each individual note.

EBR06338

each **£11.95**

D Docking Station for the BBC micro:bit

The micro:bit docking station has been designed to increase the functionality of the BBC micro:bit by accessing the micro:bit's edge connector. It opens the edge connector up into 12 4mm plug inputs, therefore, enabling you to programme more devices and components at any one time. This docking station is excellent for use with static programmable devices and would be perfect in a classroom situation to teach the new computing curriculum.

Features:

- 12 x 4mm plug inputs and outputs
- micro:bit edge connector clip
- Powered through the micro:bit's power supply

EBR06336

each **£23.95**

Spares and Accessories

Crocodile Clips

EBAS8671

pack 10 **£1.60**

4mm Stackable Plug Leads

EBR05708

Black 250mm each **£3.29**

EBR05709

Red 250mm each **£3.29**



Arduino is an open-source electronics platform based on hardware and software that is easy-to-use for beginners, yet flexible enough for advanced users. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, or publishing something online. You can tell your board what to do by sending instructions to the microcontroller using the Arduino programming language and Arduino Software (IDE). Using these tools, your Arduino can be used in a whole range of science and engineering projects - from exploring the principles of chemistry or physics, to getting started with programming and robotics.

A Arduino YUN Board

Arduino YUN is a member of a new line of wi-fi products combining the power Linux with ease of use of Arduino. The Arduino YUN is the combination of a classic Arduino Leonardo (based on the Atmega32U4 processor) with a wi-fi system-on-chip running Linino (a MIPS GNU/Linux based on OpenWRT). The Linux machine is embedded directly on the PCB of the Arduino Leonardo and the two are connected so that from Arduino it's very easy to run commands on the Linux side and use it as an ethernet and wi-fi interface.

ATmega32U4 Arduino microcontroller. Operating Voltage 5V, Input Voltage 5V, Digital I/O Pins 20, PWM Channels 7, Analog Input Channels 12, DC Current per I/O Pin 40mA, DC Current for 3.3V Pin 50mA, Flash Memory 32 KB (of which 4 KB used by bootloader), SRAM 2.5 KB, EEPROM 1 KB, Clock Speed 16 MHz, Atmega32U4 Linux microprocessor: Architecture MIPS @ 400MHz, Operating Voltage 3.3V, Ethernet IEEE 802.3 10/100Mbps, Wi-Fi IEEE 802.11b/g/n, USB Type-A 2.0 Host/Device, Card Reader Micro-SD only, RAM: 64MB DDR2, Flash Memory 32MB. **Direct Delivery - up to 2 weeks**

E8R06220

each **£59.95**

B Basic Level Workshop Kit

The basic level workshop kit contains an Arduino uno board and all necessary components to participate in an Arduino workshop.

Kit Includes: 1x Arduino uno board, 1x USB cable, 1x straight single line pinhead connectors 2, 54 40 x 1, 1x breadboard 840 tie points, 1x set of 70 breadboard jumper wires, 5 x 10K Ohm resistors 1/4W, 5 x 2.2K Ohm resistor 1/4W, 10 x 220 Ohm resistors 1/4W, 5 x 330K Ohm resistors 1/4W, 5 x 100nF capacitor polyester, 5 x 10nF capacitor polyester, 3 x 100uF electrolytic capacitor 25Vdc, 1 x 4.7K Ohm thermistor, 1 x 70-100K Ohm LDR VT90N2, 3 x 5mm red LED, 1 x 5mm green LED, 1 x 5mm yellow LED, 1 x 10Kohm potentiometer pcb terminals, 2 x BC547 transistor TO92 package, 1 x piezo buzzer, 5 x PCB pushbutton 12 x 12mm, 2 x AN35 Optocoupler DIL-6, 2 x Tilt sensor, 1 x Diode 1N4007 and 1 x MOS IRF520. **Direct Delivery - up to 2 weeks**

E8R06218

kit **£53.95**

C Arduino Robot

The Arduino robot is the first official Arduino on wheels. The robot has two processors, one on each of its two boards. The Motor Board controls the motors, and the Control Board reads sensors and decides how to operate. Each of the boards is a full Arduino board programmable using the Arduino IDE. Both Motor and Control boards are microcontroller boards based on the ATmega32U4. The Robot has many of its pins mapped to on-board sensors and actuators. Programming the robot is similar to the process with the Arduino Leonardo. Both processors have built-in USB communication, eliminating the need for a secondary processor. This allows the Robot to appear to a connected computer as a virtual (V)CD serial/COM port. As always with Arduino, every element of the platform - hardware, software and documentation - is freely available and open-source. This means you can learn exactly how it's made and use its design as the starting point for your own robots.

Control Board Summary: Microcontroller ATmega32U4, Operating Voltage 5V, Digital I/O Pins 5, PWM Channels 6, Analog Input Channels 4 (of the Digital I/O pins), Analog Input Channels (multiplexed): 8, DC Current per I/O Pin: 40 mA, Clock Speed: 16 MHz, Keypad: 5 keys, Full colour LCD, SD Card reader, Speaker 8 Ohm, I2C Soldering ports 3, Prototyping areas 4.

Motor Board Summary: Microcontroller ATmega32U4, Operating Voltage 5V, Digital I/O Pins 4, PWM Channels 1, Analog Input Channels 4 (same as the Digital I/O pins), DC Current per I/O Pin 40 mA, IR line following sensors 5, I2C Soldering ports 1, Prototyping areas 2.

Direct Delivery - up to 2 weeks

E8R06219

each **£179.95**

D Arduino and Raspberry Pi Posters

Complete your computing display with this set of 2 large posters, which cover the need-to-know information about popular microcontroller boards. Teachers notes included.

E8R06234

pack 2 **£21.95**



A Raspberry Pi™ 2 Model B Plug 'N' Play Kit

As the Raspberry Pi™ Model B Starter Kit, but with the addition of a USB Mouse and Keyboard, USB WiFi dongle, HDMI and Ethernet cables.

Direct Delivery – up to 7 days
E8R05765



C Raspberry Pi™ 2 Model B Media Centre

Designed to provide a value for money media centre solution. Stream audio, video and other digital content once it is built. Kit contains Raspberry Pi™ Model B, 8GB micro SD card with adaptor and OS, micro USB, Black Multicom™ case, HDMI cables, remote control, wireless receiver and full user guide.

Direct Delivery – up to 7 days
E8R05768



E Raspberry Pi™ 2 Model B Camera Kit

Get started capturing standard and high definition photos and videos with this easy to use camera kit. Ideal for time lapse and slow motion photography, making it suitable for wildlife projects. Infra Red feature. Case allows camera board to be mounted in a number of ways. Kit contains Raspberry Pi™ Model B, 8GB micro SD card with adaptor and OS, micro USB, clear Multicom™ case, USB WiFi wireless dongle, NoIR camera board and full user guide.

Direct Delivery – up to 7 days
E8R05766

All Direct Delivery



New

B Raspberry Pi™ Pi2 Go Robot

Supports all models of Raspberry Pi™, no separate chassis as all connections on main board. 5V switching regulator supplies the Pi and Pi2Go, 2 DC motors, 3x IR obstacle sensors detects objects within 10cm, 2x IR line sensors to program the Pi2Go to follow lines. Ultrasonic distance sensor for distance to objects. Non-dedicated switch to change mode, switch off, etc. 4 Pairs of controllable RGB LEDs, 4 light sensors with analogue to digital converter built in, 4 Servo outputs controlled by onboard hardware. Actual power supply monitor. No soldering required. Requires 6 x AA batteries (not included).

Direct Delivery – up to 7 days
E8R06340

each £71.95



D Raspberry Pi™ Touchscreen Display

Turn your Raspberry Pi™ into a Touchscreen tablet, infotainment system or stand alone device. 10 Finger capacitive touch. Screen dimensions: 194 x 110 x 20mm, viewable screen size: 155 x 86mm. Screen resolution 800 x 480 pixels. Includes: Adaptor board, DSI ribbon cable, 4 x Stand-offs and screws and 4 x Jumper wires.

Direct Delivery – up to 7 days
E8R06325

each £59.95



New

F Raspberry Pi™ Sense HAT

The Raspberry Pi™ Sense HAT is attached on top of the Raspberry Pi™ via the 40 GPIO pins. The Sense HAT has several integrated circuit based sensors that can be used for many different types of experiments, applications, and even games. Includes: Gyroscope, Accelerometer - Linear acceleration sensor, Magnetometer - Magnetic Sensor, Barometer, Temperature sensor, Relative humidity sensor, 8x8 LED Matrix display and a Small S button joystick.

Direct Delivery – up to 7 days
E8R06324

each £35.95



Laika: Raspberry Pi Robotics Interface

Laika takes Raspberry Pi to the next level. Together, Raspberry Pi and the Explorer² enable you to quickly and easily create amazing projects without feeling overcome with circuit diagrams and tricky electronics. All Laika products are robust and are designed to industrial standards giving you the freedom to experiment and gain the confidence you need to make teaching or learning computing and robotics easy.

You can begin with the Laika Explorer² which comes with everything you need to start. It plugs into your Raspberry Pi and allows you to control motors, switches, lamps, relays, solenoids and much more, all through programming in Scratch or Python.

All Laika projects come with comprehensive teaching materials guiding you through each step from switching on for the first time through to having a complete system running, reading inputs and controlling outputs.

Laika is the easiest way to teach the principles of robotics and hardware control through software programming. Students can control motors through scratch or python with simple coding, but allows more complex problem solving as their knowledge grows.

A Laika Explorer²

Laika is a sensational system merging the worlds of computing and science. Take an Explorer² and a Raspberry Pi or a Windows PC, and together you can automate and control your science experiments live in the classroom. Supplied with an SD card for the Raspberry Pi with all software installed and ready to go, with easy to follow, lesson based examples and tutorials you will be amazed at what you can achieve with Laika. Once set up by plugging the Explorer² directly into a Raspberry Pi or PC via USB, you can write refreshingly simple code to control all the features Laika has to offer.

Students are able to control and interface to motors, thermistors, potentiometers, lamps, breakout boards and more. It is a great way to learn about how electronics can be controlled by software. You can start with a simple temperature data logger and view the results live over your network or even on the web!

Kit contains 1 x Laika Explorer², 1 x 9v dc power adaptor, 1 x USB lead, 1 x SD card installed with all software for Raspberry Pi and 8 x 4mm banana leads.

E8R05638

Kit £239.95



B Laika Buggy

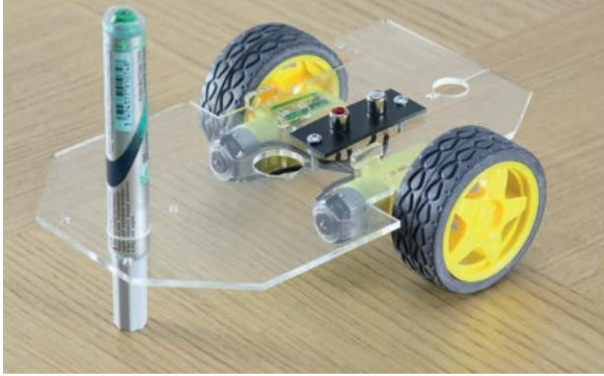
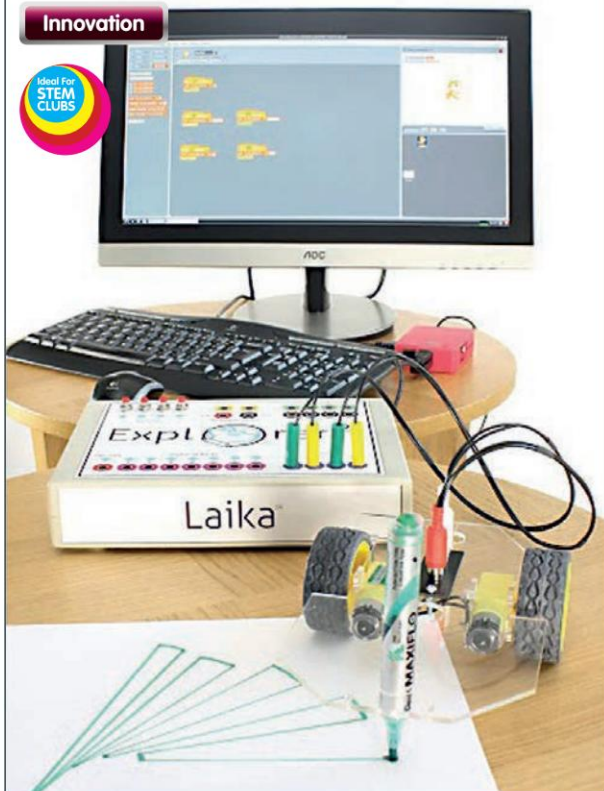
The Laika Buggy is a classroom essential and a quick and simple way to teach introductory robotics. You're really just controlling two motors but this little platform brings it all to life with a drawing buggy robot. Simply push a whiteboard marker through the mounting hole and write code to draw shapes. Suitable for use in Primary and Secondary classrooms, this easy to use platform is an excellent starting point, making programming fun at all levels.

Kit contains 1 x Laika Buggy, 2 x phono to 4mm banana leads and 1 x whiteboard marker.

E8R05640

each £59.95

Innovation





A Bugnoculars

Plastic observation box with binocular-like pair of 3X magnifiers. Use the two sets of tweezers to place bugs, plants and other specimens in the waterproof tub, then close the lid to observe them in great detail. Box features air holes, overlapping seal, carry handle and holders for tweezers. Includes wide grip and fine grip tweezers.

EBR06253

each £5.49

B Jumbo Bug Jars

These adorable jars have ladybird wings that open to invite pupils to investigate insects. Wings open to reveal a 3.5X magnifying lens. Screw-on cap and air vents keep specimens secure. Pack of 6 durable plastic jars, measuring H110 x W80mm. Recommended for students when gathering and identifying objects in all years and especially in Year 2 Living Things and their Habitats.

Age Suitability: 3 Years +

EBR06230

pack 6 £39.95

C Jumbo Magnifiers

Each magnifier's plastic lens measures approx. 110mm and offers 4.5X magnification. Built in stand for hands free viewing. Pack of 6 different colours per set. Ideal for your pupils looking at the nature around them up close in Year 2 Living Things and their Habitats.

EBR06239

pack 6 £24.95

D Jumbo Test Tubes

Great way to introduce science and working scientifically to young pupils. Chunky, durable test tubes put serious science safely within reach for young students. Plastic tubes are safe at temperatures from 10° - 200°F (-12° - 93°C) and feature calibration marks (25, 50, 75 and 100mL). Test tubes feature different coloured lids. Sturdy rack and activity guide included. Pack of 6. Tubes measure H150 x W30mm. Ideal for measuring water and rain in Key Stages 1 and 2.

Age Suitability: 3 Years +

EBR06231

pack £16.95

E Double Lens Magnifier

The main 50mm lens is 4X magnification and the 21mm secondary lens is 6X magnification. Pack of 10.

EBR06032

pack 10 £19.95

F Jumbo Insects

Now your class can explore insects in detail without any magnification required! Realistic looking fly, ant, bee, ladybird, grasshopper, butterfly and dragonfly are great for imaginative play, early science and theme-based lessons. Largest insect (grasshopper) measures L190 x H140mm.

Age Suitability: 5 Years +

EBR06232

pack 7 £30.95



G Easy Grip Tweezers

Just the right size for little hands! 150mm tweezers make the perfect tool for early science investigations. Ergonomic depressions guide a proper grip. Pack of 12 tweezers in 6 different colours red, blue, green, yellow, orange and purple, stored in a resealable bucket. Includes an activity guide. Recommended for teaching pupils to explore and identify items in Year 2 Living Things and their Habitats.

Age Suitability: 3 Years +

E8R06252

pack 12 £14.95

H Early Science Explorers Set

Encourage young scientists to take their investigations further with these perfectly sized tools. Magnifier features built-in stand for hands-free observation, clear 4.5X magnification and 11cm diameter viewing area. Exercise fine motor skills with 15cm Jumbo Tweezers featuring easy-grip depressions for proper pincer positioning. Colours may vary.

E8R06262

set 2 £7.99

I Plastic Potter

A durable plastic container with a screw cap, with safety filler.

E8A24995

each £2.49

J Tripod Magnifier

Rest this 4X magnifier on the table, floor or ground to view any object. Made from wood, this is a high quality magnifier. Size: 180 x 230mm.

E8R06229

each £35.95

K Jumbo Essentials Pack

Great value pack containing 6 pairs of giant tweezers, 6 jumbo bug jars, 6 jumbo magnifiers, 6 jumbo test tubes in a storage rack and 7 jumbo insects.

E8R06233

pack £106.95

L Bug Tongs

Scissor action plastic bug tongs, a bug hunting necessity! 130mm long.

E8R06254

pack 5 £3.59

M Magnifier Set

This 35 piece set contains a variety of magnifying instruments which can be used for a selection of experiments. The magnifiers are of differing strengths and allow for many areas of experimentation.

E8R06033

set £39.95

N Magnifier Centre

Featuring chunky handles to make them easy for small hands to hold. The 6 20cm magnifiers come in a sturdy hardwood storage centre.

E8R06259

set £99.95

O Plastic Hand Magnifiers

Good quality, hard wearing magnifiers with dual magnification.

E8R06240

pack 10 £14.95

SAVE

Buy 4 Packs of Wands and get a Pack of Marbles FREE! Only **£31.95**

E8R06260

CURRICULUM LINKS

Forces and magnets

- Notice that some forces need contact between two objects, but magnetic forces can act at a distance
- Observe how magnets attract or repel each other and attract some materials and not others



A Magnetic Match Rings

Magnetic Match Rings are a fun way to learn about magnetism and improve eye-hand co-ordination. Each ring is magnetic, one side positive and the other negative.

When you stack the rings on the pole, they either attract the next ring (snap together), or repel the next ring (push apart or cause it to float, creating a space in the stack).

- Comprises 10 brightly coloured magnetic rings, 40 pattern matching cards and 1 stand
- Develops visual matching skills and problem solving
- Teaches magnetic properties

To Play: Select one of the 40 pattern matching cards and stack the magnetic rings in the exact same colour order as shown on the card.

Contents: 10 rings, 40 cards and 1 stand

Warning: This toy contains magnets or magnetic components. Magnets sticking together or becoming attached to a metallic object inside the human body can cause serious or fatal injury. Seek immediate medical help if magnets are swallowed or inhaled.

Warning: Choking Hazard due to small parts: not suitable for children under 3 years old.

E8R06261

each **£11.95**

B Magnetic Wand

Pack of 6 magnetic wands, 1 each of red, blue, green, yellow, orange and purple.

E8R06257

pack 6 **£7.99**

C Magnetic Marbles

Encased within a plastic shell, magnetic marbles are an ideal introduction to the properties of magnets.

E8R06258

pack 50 **£5.99**

D Super Magnets

Feel the ultimate pulling power of magnetism with these incredible Super Magnets. Housed in tough colour coded outer mouldings (red - North, blue - South) the design allows children to safely experience first hand the force of neodymium, currently the world's strongest permanent magnet!

E8R06256

pack 2 **£10.95**

E Floating Ring Magnets

Demonstrate attraction - and repulsion! Diameter of magnets: 23mm. Overall height of base and rod: 125mm.

E8R06036

each **£3.79**

F Coloured Floating Ring Magnets

Coloured ring magnets which, if placed on the rod supplied and orientated so that they mutually repel, will "float" one above the other. Includes activity cards.

E8A47193

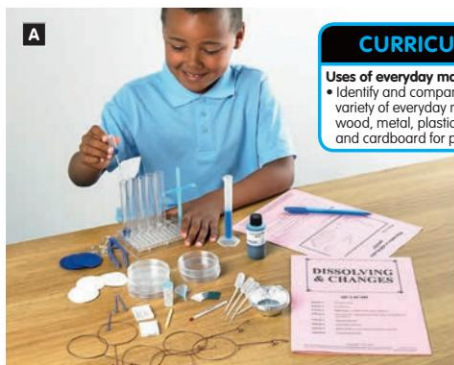
pack 6 **£27.95**

G Mighty Magnets

Explore magnetism with these light, chunky and colourful horseshoe shaped magnets. These 120mm magnets are perfect for small hands.

E8R06255

set 6 **£16.95**



CURRICULUM LINKS

Uses of everyday materials

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses



Mini Science Kits

These fantastic Primary Science equipment kits provide the non-specialist teacher with the time and confidence to engage children in various practical activities. Each kit focuses on a particular Science unit of the QCA Guidelines for Key Stage 2 and contains user friendly components and teacher's guide. Each kit can be used with up to 3 children.

A Dissolving and Changes Kit

This kit has resources for many lessons, including:

- Cleaning water
- Evaporation
- What makes a solid dissolve more quickly?
- Temperature and the effects on dissolving
- Mixing materials
- What changes occur when materials are mixed?
- Changing materials

EBR06238

kit £42.95

B Characteristics of Materials Kit

Based on the QCA unit 3C, this kit covers lessons such as:

- What are the characteristics of materials?
- Which materials are hard wearing?
- Which fabric is the strongest?
- What are our clothes made of?
- What is hard?
- What effects how high a ball bounces?
- How much water do different papers absorb?
- What materials are flammable?

EBR06236

kit £42.95

C Gases Around Us Kit

This kit includes resources for a variety of activities, including:

- Examining the differences between solids and liquids
- Comparing the amount of air in different soils
- Naming gases
- Investigating where water goes
- Defining solids, liquids and gases

EBR06237

kit £42.95

D Solids and Liquids Kit

Based on the QCA Unit 4D, this kit includes materials for lessons such as:

- Comparing solids and liquids
- In what way do some solids behave like liquids?
- How do we separate a mixture of solids?
- What happens to other solids when mixed with water?
- What is the difference between a substance melting compared to a substance dissolving?
- Which material makes the best filter?

EBR06235

kit £42.95



A Arduino and Raspberry Pi Posters

Complete your computing display with this set of 2 large posters, which cover the need-to-know information about popular microcontroller boards. Teachers notes included.

EBR06234

pack 2 £21.95

B Hands-on Science

36 fun photocopiable science activities per book to encourage 'learning by doing' – through conducting experiments, investigating, designing, making, constructing, cooking, role-playing and more. Encourage collaborative learning that makes science exciting and interesting. Help pupils gain understanding of essential scientific concepts and learn new skills. Includes digital version on a CD and detailed Teachers Notes.

Age Suitability: 5 Years +

EBR06241

pack 2 £66.95

C Evolution Poster

Printed on durable, no tear plastic with a wipe clean surface. This evolution poster is packed with key facts, explanations and timescales on both the evolution of man and earth. Perfect for classroom use. Size: 1200 x 600mm.

EBR06019

each £53.95

Pocket Posters

Science Pocket Posters are a simple and affordable reference book that will help pupils with homework assignments, class activities and revision. The colourful and informative books contain 30 award-winning posters that highlight key curriculum topics in a bright and colourful format.

D Key Stage 2 Science

EBR06243

each £23.95

E Key Stage 3 Science

EBR06244

each £23.95

F Science Dictionary

Defining key words in the science curriculum.

EBR06242

each £16.95

G Nature Wallbook

The complete story of natural history in 1,000 species on a 2.4 metre-long timeline beginning with the formation of the Earth to the latest break-throughs in evolutionary science.

Direct Delivery – up to 2 weeks

EBR06322

each £23.95

H Science Wallbook

A timeline of inventions from the Stone Ages to the present day. A beam of brilliant white light contains a timeline that shines into Sir Isaac Newton's prism in c. 1680 before spreading out into a spectrum of colours that represent all the main themes of science and engineering from abstract to infinity. More than 1,000 pictures and captions tell the story of Maths, Measurement, Physics, Chemistry, Medicine, Biology, Earth, Land, Building, Invention and Transport.

Direct Delivery – up to 2 weeks

EBR06321

each £23.95

I 100 Science Lessons

100 Lessons is Scholastic's best-selling series to support primary teachers with curriculum change. This new resource will support teachers with their planning in preparation to deliver the new curriculum for science to be taught in schools from 2014. This book contains a year's worth of lessons and photocopiable activities, plus a CD-ROM packed with interactive activities and media resources.

EBR06245

Planning Guide

each £33.95

EBR06246

Year 1

each £53.95

EBR06247

Year 2

each £53.95

EBR06248

Year 3

each £53.95

EBR06249

Year 4

each £53.95

EBR06250

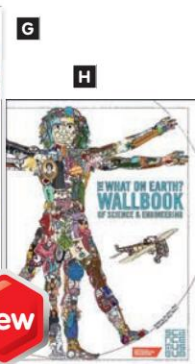
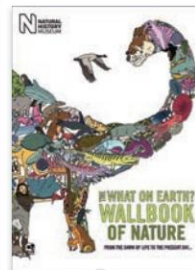
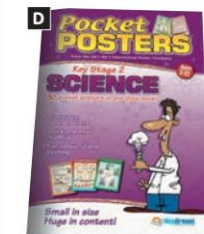
Year 5

each £53.95

EBR06251

Year 6

each £53.95



Direct Delivery

New



Also Available in Year 2 - Year 6

STEM[™] in Action[™]

brought to you by


Learning Resources[™]
The Brand Teachers Trust[™]

Practical STEM solutions for every primary classroom!

Exclusive

All
New

STEM in Action[™] is an exciting new range of comprehensive hands-on kits bringing Science, Technology, Engineering and Maths to life in Key Stages 1 and 2. Each teacher-friendly kit addresses a host of the new 2014 English National Curriculum requirements in science, design and technology and maths, and provides the primary teacher with everything needed to start teaching, right out of the box. STEM in Action promotes independent and joint problem-solving, collaborative thinking and co-operative team-work. This progressive project-based range provides positive experiences building confidence and as interest in STEM from an early age.

⚠ WARNING: CHOKING HAZARD - Small parts, not for children under 3 years.

1 Sunny Sandbox Exploration Kit

In this exploration students are introduced to science concepts such as how sunlight heats the ground and how objects that block sunlight cast shadows. The resource tests materials to find which block sunlight or allow it to pass through. Students develop mathematical skills by recording data and drawing conclusions supported by evidence gained. Torch requires 4 AA batteries, NOT included.

Designed for
Key Stage 1 Year Group 1

AGES 5-6 EBR06306 kit £239.95

2 Pam and Ava's Mapping Adventure Kit

In this project students learn about maps and coordinates whilst following Pam and Ava around a National Park. Students gain an understanding of the relevance of contour lines in a fun and interactive way. Through the process students encounter challenging concepts made understandable through practical exercises and will be able to design and develop their own map of the park.

Designed for
Key Stage 1 Year Group 2

AGES 6-7 EBR06305 kit £239.95

3 Ron's Ramp Adventure Kit

Students are introduced to the effects of friction through Ron, a skateboarding Armadillo. This fun practical exploration introduces the concepts of guessing (predicting), graphing and recording data. Additionally, it develops an understanding of the effects of gradients on a rolling object and distance travelled. This kit will absorb students as they learn by experimenting.

Designed for
Key Stage 1 Year Group 2

AGES 6-7 EBR06304 kit £239.95

4 Wild Feet Exploration Kit

This kit explores the comparison of different materials and friction properties through engineering and design. It considers how different animals naturally keep from slipping and how we can learn from nature to solve problems. The project incorporates the practical skills of planning and conducting investigation. It also introduces using quantitative data to make comparisons and claims supported by evidence.

Designed for
Key Stage 2 Year Group 3

AGES 7-8 EBR06302 kit £239.95

5 Earthquake Technologies Challenge Kit

In this challenge students learn about earthquakes, what they are and where they can occur. They develop an understanding about engineering design and how engineers are involved in keeping people safe. The students test earthquake-safe technologies and adhere to budget constraints. They also develop skills in using models and making claims based on actual evidence and communicating technical information. VersaTimes[®] each require 2 G10-A Button Cells, included.

Designed for
Key Stage 2 Year Group 4

AGES 8-9 EBR06303 kit £239.95

6 Silly Straws Challenge Kit

Through building a point-of-sale stand this challenge introduces students to the concepts of problem-solving through design, prototyping and evaluation. It provides further understanding in the use of materials within design and cost constraints. It also extends their skills in model-building and making claims based on evidence as well as the communication and use of technical information.

Designed for
Key Stage 2 Year Group 5

AGES 9-10 EBR06300 kit £89.95

1, 2, 3, 4

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BUSINESS TO BUSINESS INTERNATIONAL TERMS AND CONDITIONS

Please read these terms and conditions carefully before ordering any Goods from us. You should understand that by ordering any of our Goods, you agree to be bound by these terms and conditions.

1. INTERPRETATION

1.1 The definitions in this condition apply in the Terms and conditions set out in this document.
1.2 **Force Majeure Event:** has the meaning given in condition 9.
1.3 **Goods:** the products that will be sent to you as set out in the Order.
1.4 **Order:** your order for the purchase of our products.
1.5 **Order Confirmation:** has the meaning set out in condition 2.
1.6 **Terms:** the terms and conditions set out in this document.
1.7 **Working Day:** Monday – Friday (excluding any day which is a public holiday in England).
1.8 **Writing or written:** includes faxes and e-mail.
1.9 **Headings:** do not affect the interpretation of these terms.
1.10 These Terms apply to the sale of Goods and services outside of the United Kingdom and Northern Ireland including the Channel Islands and BPOs. Alternative terms and conditions apply to the sale of goods to consumers and to customers within the United Kingdom and Northern Ireland.

2. BASIS OF SALE

2.1 These Terms, the Order and our price list set out the whole agreement between you and us for the sale of the Goods. Please check that the details in the Terms on the Order are complete and accurate before you commit yourself to the agreement. If you think that there are errors, please make sure you ask us to confirm any changes in writing, as we only accept responsibility for statements and representations made in writing by our authorised employees or agents. Please ensure that you read and understand these Terms before you sign and submit the Order, because you will be bound by the Terms once a Contract comes into existence between us, in accordance with condition 2.
2.2 These Terms apply to the agreement to the exclusion of any other terms that you seek to impose or incorporate, whether by trade, custom, practice or course of dealing.
2.3 Any samples, drawings, descriptions or advertising we use, and any descriptions or illustrations contained in our catalogues or brochures, are issued or published solely to provide you with an approximate idea of the goods they describe. They do not form part of the contract between you and us or any other contract between you and us for the sale of the Goods.
2.4 If any of these Terms are inconsistent with any term of the Terms that prevail.

2.5 Your Order is an offer to enter into a binding contract, which we will accept or decline at our absolute discretion.
2.6 When you submit an Order to us on our website you will receive an email acknowledging your Order (Order Confirmation). The Order Confirmation does not constitute acceptance of the Order by us. Your order is accepted and a contract is formed between you and us when we despatch the goods you have ordered and not before. Until the Goods are despatched the order may not be accepted by us.
2.7 Delivery notes will be sent to you by email with your Order. If the Order has been despatched, if your Order is despatched in more than one parcel, you may receive separate delivery notes for each parcel, and each delivery note and corresponding despatch will constitute a separate contract of sale between us for the products ("Contract") specified in that delivery note. Any Goods supplied outside the Terms of the Contract.
2.8 Any quotation for the Goods is given on the basis that a binding contract shall only come into existence in accordance with conditions 2.5 and 2.6. A quotation shall be valid for a period of 30 calendar days from its date issue, unless we notify you in writing that we are extending this period.
2.9 We shall assign an order number to the Order and inform you of it in the Order Confirmation or delivery note.
2.10 Please quote the order number in all subsequent correspondence with us relating to the Order.
2.11 We have the right to raise and amend these Terms from time to time. You require us to update the copy of these Terms please contact us to request one from our customer services department. You will be subject to the policies and terms in force at the time that you order the Goods from us, unless any change to these policies or these Terms is required by law or government or regulatory authority in which case, it will apply to Orders you have previously placed that we have not yet fulfilled.
2.12 Some products within the catalogue and certain accessories are exempt from promotional discounts of our sale promotion. Please ask our customer service department for details.

3. OUR GUARANTEES

3.1 We warrant that on delivery the Goods shall:
3.1.1 be of satisfactory quality;
3.1.2 be free from material defects in design, material and workmanship; and
3.1.3 comply with all applicable statutory and regulatory requirements for selling the Goods in the United Kingdom.
3.2 This warranty does not apply to any of the Goods arising from fair wear and tear, willful damage, accident, negligence by you or any third party. If you use the Goods in a way that we do not recommend, your failure to use our instructions, or any alteration to or use of the Goods, we do not make any other warranties or representations with regard to the Goods. To the extent that we are not prohibited from doing so by law we hereby exclude all warranties which are implied into these Terms whether by legislation or otherwise.
3.3 These Terms apply to any repaired or replacement Goods we supply to you in the unlikely event that the original Goods are faulty or do not otherwise conform with these Terms.
3.4 We set out in these Terms our warranties and conditions and other terms implied by statute or common law to the fullest extent permitted by law, dependent on location.

4. DELIVERY

4.1 All delivery times are estimates and vary depending on location. We can advise you of these at the time of order. All of these estimates are dependent on our manufacturer having the relevant Goods in stock at the time of your Order. Direct delivery items may incur a charge. You will be informed of any additional charges at the time of ordering.
4.2 Delivery of the Order shall be completed when we deliver the Goods to you.
4.3 We will take reasonable steps to meet any estimated delivery date. However, delivery times cannot be guaranteed, for example occasionally, delivery may be affected by factors beyond our control including the failure of our agents or subcontractors.
4.4 Five full delivery days you must notify us within 5 Working Days of the estimated delivery date. Any claim made after the 5 Working Days period will not be accepted. Our liability shall be limited to the direct costs and expenses that you incur in obtaining replacement Goods of similar description and quality in the cheapest market available, less the price of the Goods. We shall have no liability for any failure to deliver the Goods to the extent that such failure is caused by a Force Majeure Event or your failure to provide us with accurate delivery instructions or any other instructions that are relevant to the supply of the Goods.
4.5 If you fail to take delivery of an Order, then, except where the failure is caused by the failure to comply with these Terms or by an event beyond your control:
4.5.1 we will store the Goods until delivery takes place and may charge you a reasonable sum to cover storage, insurance and other expenses incurred and
4.5.2 we shall have no liability to you for the Goods or DIO, whichever is the greater.

4.6 If you have not taken delivery of the Goods within 5 Working Days of our notifying you that they are ready, we may, after giving you reasonable prior notice in writing, resell or dispose of part or all of the Goods or after deducting reasonable storage and handling charges, pay you for any excess over the price of the Goods or charge you for any shortfall below their price.
4.7 If we are not able to deliver the whole of the Order at one time due to operational reasons or shortage of stock, we will deliver the Order in instalments. We will not charge you extra delivery costs for this. If you ask us to deliver the Order in instalments, we may charge you extra delivery costs. Each instalment shall constitute a separate contract. If we are delivering an instalment or one instalment is faulty, that will not entitle you to cancel any other instalment.
4.8 If upon delivery you discover that the Goods are damaged or have not been delivered in accordance with your order then you must notify us of this within 5 Working Days of the date of delivery. If you fail to do so then you will not be obliged to remedy the defect.
4.9 Unless otherwise agreed, delivery shall be deemed to have been completed when we have delivered the Goods in accordance with the ICDO terms set out in our catalogue.
4.10 Please note that certain chemicals will be subject to a delivery charge. The affected products are clearly marked on the catalogue page.

5. DEFECTIVE GOODS AND RETURNS

5.1 In the unlikely event that the Goods do not conform with these Terms, you must notify us within 5 Working Days of receipt of the Goods and in any event as soon as possible after delivery. Failure to notify us within 5 Working Days of receipt will invalidate any claim with regard to the defect, including your right to return the Goods for a refund. The return of the Goods and arranging for the Goods to be collected by us with a return label is at your expense. We shall not be responsible for any delay caused by a third party carrier. Ask you to return the Goods to us at our cost and once we have confirmed that the Goods are faulty, we will:
5.1.1 provide you with a full or partial refund;
5.1.2 replace the Goods or
5.1.3 repair the Goods.
5.2 These Terms apply to any repaired or replacement Goods we supply to you.
5.3 Having checked any returned goods, we have found that they are not faulty, we may charge you a handling fee equivalent to 20% of the net value of the goods and only pay you the balance of the price of the Goods.
5.4 We cannot accept the return of any goods which contain living organisms or cultures, lab, dissection resources, or preserved specimens, (i.e. chemicals, lab goods that are substantially made up of materials that can be reprocessed, i.e. reusable goods, i.e. radioactive sources).

6. TITLE AND RISK

6.1 It will be your responsibility from the time of delivery of the address stated in the Order.
6.2 Ownership of the Goods will only pass to you on payment in full and cleared funds of all sums due for the Goods and any other Goods that we have supplied to you.

6.3 We can recover any Goods in respect of which ownership has not passed to you in accordance with clause 6.2 above. You must agree, immediately following written request from us, allow us access to the Goods and to such premises as are required to access the Goods as is required by us in order to facilitate such recovery.

7. PRICE AND PAYMENT

7.1 Prices may vary to those that appear in our catalogue or
7.2 the prices of the Goods will be as set out in the quotation we provided to you; or, if we have not provided a quotation or the quotation has expired, in our price list in force at the time we confirm your Order. Prices are liable to change at any time, but prices changes will not affect orders that we have confirmed in writing.
7.3 Orders include VAT.
7.4 Unless otherwise specified, prices exclude delivery costs (including but not limited to cartage, freight and insurance and any special costs), which will be added to the total order value. All deliveries to the Republic of Ireland will be subject to a £10 carriage charge for orders under £30.
7.5 It is always possible to agree to our best offers, as prices of the Goods we sell may be inaccurately priced and we will, at our discretion, issue an errata list from time to time (also available on our website). Where the Goods' correct price is less than or higher than our stated price, we will charge the correct price when despatching the Goods to you.
7.6 If you do not have a credit account with us payment for all Goods must be made in advance by credit or debit card, BACS, letter of credit confirmed by a UK bank, bank draft, or by sterling cheque. We do not offer credit accounts to individuals, sole traders or partnerships with less than three partners.
7.7 If you have a credit account with us we may invoice you for the Goods on or any time after the date we have delivered the Goods to you. The invoice will specify the Order Number. Unless alternative payment terms have been specified by us, you must pay the invoice in cleared monies within 30 calendar days of the date of the invoice. Please note that payment pursuant to this clause 7.7 will only be permitted at our absolute discretion and we reserve the right to require payment to the date of the invoice.
7.8 If you do not make any payment due to us by the due date for payment (as set out in conditions 7.5 and 7.6), we may charge interest at 10% on the overdue amount of the rate specified in the Data Protection of Commercial Debt (Interest Act 1998) as amended from time to time. This interest shall accrue on a daily basis from the due date until the date of payment of the overdue amount, whether before or after judgement. You must pay us interest together with the overdue amount.

8. LIMITATION OF LIABILITY

8.1 In condition 8.1 and 8.2 we shall only be responsible for losses which are a direct consequence of our failure to comply with these Terms and our total liability to you for all direct, proven and reasonable losses arising under or in connection with a Contract whether in contract, tort (including negligence), breach of statutory duty, or otherwise shall not exceed the price paid or payable for the Goods.
8.2 We shall not be responsible for losses that you suffer as a result of our failure to comply with these Terms that fall into the following categories (whether we were notified of or aware of the possibility of such losses or not):
8.2.1 loss of income or revenue;
8.2.2 loss of business;
8.2.3 loss of anticipated savings;
8.2.4 loss of time or effort;
8.2.5 any waste of time;
8.3 We do not limit or exclude liability for:
8.3.1 death or personal injury;
8.3.2 fraud or fraudulent misrepresentation or
8.3.3 any other matter for which it would be illegal or unlawful for us to exclude or attempt to exclude our liability.
8.4 You are responsible for the selection and safe use of any chemicals that you order from us and to the extent that any losses you suffer from such chemicals result from your default, we shall not be responsible.
8.5 Except for the warranties expressly set out in these Terms we do not make any other warranties or representations with regard to the Goods. To the extent that we are not prohibited from doing so by law we hereby exclude all warranties which are implied into these Terms whether by legislation or otherwise.

9. EVENTS OUTSIDE OUR CONTROL

9.1 We will not be liable or responsible for any failure to perform, or delay in performance, of, or any of our obligations under these Terms that is caused by events outside our reasonable control ("Force Majeure Event").
9.2 A Force Majeure Event includes any event which is beyond our control and makes any other warranties or representations with regard to the Goods, in particular (without limitation), the following:
9.2.1 strikes, lock-outs or other industrial action;
9.2.2 hijack, piracy, war, invasion, political chaos, terrorist attack or threat of terrorist attack, war, whether declared or not or threat of preparation for war;
9.2.3 riot, explosion, storm or other adverse weather, flood, earthquake, subsidence, epidemic or other natural disaster;
9.2.4 impossibility of the use of railways, shipping, aircraft, motor transport or other means of public or private transport or
9.2.5 impossibility of the use of public or private telecommunications networks.
9.3 Our obligations under these Terms are suspended for the period that the Force Majeure Event continues, and we will have an extension of time to perform these obligations for the duration of that period. We will take reasonable steps to bring the Force Majeure Event to a close or to find a solution by which our obligations under these Terms can be performed despite the Force Majeure Event.

10. EXCLUSIVE GOODS

10.1 Goods which are described as being exclusive are exclusive to Findel Exchange Limited (Company Number: 11335872).

11. DATA PROTECTION

11.1 We shall comply with our obligations under the Data Protection Act 1998. We may record your calls for quality assurance.
11.2 **DISPOSAL OF WASTE ELECTRICAL EQUIPMENT**
We are committed to promoting the re-use, recycling and recovery of WEEE products by contributing to the WPAUK compliance scheme. WEEE products or packaging will be marked with a crossed out wheeled bin symbol to indicate that the Goods should not be disposed of in general domestic waste but disposed of through an approved WEEE scheme. For more information please see our website at call +44 (0) 175 907 400. If you do not wish to participate in the scheme, please inform us at the time of ordering. Shipping costs or packaging of returned Goods. All costs associated with the return of WEEE will be your responsibility.

12. ASSIGNMENT

12.1 You may not transfer any of your rights or obligations under these Terms to another person including a body corporate without our prior written consent, which we will not withhold unreasonably. We can transfer all or any of our rights and obligations under these Terms to another organisation, but this will not affect your rights under these Terms.

13. NOTICES

13.1 All sent by you to be notified to **Philip Harris, Pinal Co, Victoria Business Park, Nottingham, NG24 5QE**. You may give notice to you at either the email or postal address you provide to us in the Order. Notice will be deemed received and properly sent 24 hours after an e-mail is sent or three days after the date of posting of any letter. In proving the service of a notice, it will be sufficient to prove, in the case of a letter, if it was properly addressed, stamped and placed in the post, and in the case of an e-mail that it was sent to the specified e-mail address of the addressee.

14. GENERAL

14.1 If any court or competent authority decides that any of the provisions of these Terms are invalid, unlawful or unenforceable in any event, the term, to that extent only, be severed from the remaining terms, which will survive to the fullest extent permitted by law.
14.2 If we fail, at any time while these Terms are in force, to insist that you perform any of your obligations under these Terms, or if we do not exercise any of our rights or remedies under these Terms, that will not mean that we have waived any liability to you or that we are releasing you from your obligations. It will be sufficient to prove, if it was waived a default by you that we did not mean that we will automatically waive any subsequent default by you. No waiver by us of any of these Terms shall be effective unless we expressly say that it is a waiver and we tell you so.
14.3 A person who is not party to these Terms shall not have any rights under or in connection with them under the Contracts (Rights of Third Parties) Act 1999.
14.4 You are responsible for obtaining your own cover, such as import licences and other consents in relation to the Goods as are required from time to time and if we require, you shall make such consents available to the relevant shipment.
14.5 If costs required under any applicable law to deduct or withhold any amount due to us, you shall increase the amount that you pay to us by the amount necessary so as to ensure that we receive the amount which we would have received from you had no such deductions or withholdings been made.
14.6 These Terms shall be governed by and construed in accordance with the law of England and Wales. The International rules for the interpretation of trade terms prepared by the International Chamber of Commerce (INCOTERMS) apply where they conflict with these Terms. These Terms shall prevail.
14.7 These Terms include the packaging removal cost, this applies to UK orders only (excluding Channel Islands and BPOs).

Easy ways to order



Call us on: **+44 (0) 115 907 4001**
8:30am - 4:30pm Monday to Friday



Fax us on: **+44 (0) 115 907 4002**



By post to: **Philip Harris,**
Pintail Close,
Victoria Business Park,
Nottingham, NG4 2SG, UK



Shop online at: www.findel-international.com



Email us at: exportsales@philipharris.co.uk

Establishment Name:

Account No:

Country:

[illegible]

VAT Number (if applicable):

The minimum international order value is £100.

Shipping charges are dependant on destination, volume and weight of parcel and we will calculate the cost of a shipment by air, sea, road, post or courier as appropriate for you. VAT will be charged at the appropriate rate. For all EC countries VAT will be added unless a VAT number is provided.

Please note we make every effort to maintain the prices in this catalogue but prices are subject to change due to volatile raw material costs. All orders are subject to our terms and conditions.

Total value of goods exc. VAT

f

Please add VAT to your total order value for all items

11

Total Order Value

3

Thank you for your quotation request

Easy ways to order



Call us on: **+44 (0) 115 907 4001**
8:30am - 4:30pm Monday to Friday



Fax us on: **+44 (0) 115 907 4002**



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